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[redacted]

All shipbuilding in the USSR is controlled by the Ministry for the shipbuilding industry in MOSCOW. The Ministry is divided into the following main [redacted] Administrations. 25X1

(a) Large ships;
(b) Medium-sized ships;
(c) Small ships and ships for inland waterways;
(d) Electric engineering, [redacted] radio, signals and navigation;
(e) Ship repairs;
(f) Planning (Institutes and Central [redacted] Design Bureaus);
(g) Metallurgy;
(h) Radar and [redacted] sonar
(i) General [redacted] Machine Building.
(j) Instrument production, marine navigation.

The following notes are added:

(See (e) above): In order to relieve pressure of work at shipyards engaged on building new ships, it is proposed to create special shipyards for repair work.

(See (g) above): Two large metallurgical [redacted] Plants and a laboratory engaged on developing special types of steel for shipbuilding are controlled by this Main [redacted] Administration.

Since the USSR has four main coastal areas, the work of each [redacted] Main Administration is widespread and is frequently hampered by the fact that the various factories and yards are separated by such great distances.

Furthermore, the authority of the managements of local enterprises has in the past been restricted by past centralization. For these reasons the Ministry of Shipbuilding is being reorganised in its structure.

In accordance with the new structure, the factories and shipyards will no longer be managed by the Ministry but will be run by local government organisations. Institutes and Central [redacted] Design Bureaus on the other hand will continue to be centrally run. New processes and equipment developed by the Institutes will be adopted locally by order of the Ministry.

The main [redacted] Admin. for Planning will continue to exist. Certain special and experimental undertakings will also remain under the control of the Ministry. A special Main [redacted] Admin. of the Ministry will also continue to direct special factories responsible for introducing new technical methods and preparing new designs. This also applies to the Main [redacted] Admin. for general machine-[redacted] building.

The new structure will comprise the following Main [redacted] Administrations.

(a) Special [redacted] enterprises for working on new developments and [redacted] the production of construction Models
(b) Radar and steering;
(c) Special machine construction;
(d) Planning and Institutes.

The question of the Central Planning and [redacted] Design Bureaus had frequently been discussed at the Ministry and in the factories. It was considered that it would not be desirable to separate Planning from Construction.

A further detailed discussion dealt with the scope of documentation. Experience had shewn that this had hitherto been too great and measures have already been taken to reduce it in volume.

5.3 <u>Training of future engineers and technicians at [redacted] advanced technical schools and [redacted] Trade Schools</u>

The training of students is being carried out according to well established study plans. Training is very intensive and stress is laid on practical work. In order to enter the Shipbuilding Institute in LENINGRAD

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students must have a high school leaving certificate or must have qualified at a technical institute. In addition they must have absolved two years' practical work. Students who satisfy these conditions must then sit an entrance examination in five subjects so that only the best applicants are accepted.

Of particular interest to us is the way in which the practical work is organised and we might do well to introduce this system in our own training establishments. At the LENINGRAD Shipbuilding Institute, all students - whether or not they are qualified engineers - have to undergo a course in technology after the first term. This course is carried out in the Institute itself, where the necessary equipment is available.

After the sixth term, students are given a technological apprenticeship. After the eighth term, a further apprenticeship is served at the planning or construction departments of Central Construction Bureaux or shipyards. We saw for the first time how student engineers undergo an apprenticeship on board ships in the fourth or fifth year. It was explained to us that an engineer who was going to build ships should acquaint himself with the working of ships at sea.

A large number of intermediate examinations are held at intervals throughout the courses at the LENINGRAD Shipbuilding Institute. During each term, a test examination is held in two or three and sometimes in four subjects. Four or five months are set aside for preparing for the diploma. After the eighth term, subjects taught are directly related to the work of preparing for the diploma.

The method of preparing for the diploma is very good. The instructors and lecturers as well as expert consultants from industry help the students prepare for their diploma.

The way the examinations are organised is particularly worthy of recommendation. At the LENINGRAD Shipbuilding Institute there is a State Examinations Committee, the chairman of which is a representative from the Ministry or a specialist not belonging to the Institute's staff. The deacons of the faculties make up the rest of the committee. This arrangement ensures objectivity and maintains close and constant contact between teaching, research and industry.

The student organisations have an important role to play. They organise student scientific societies which run under the supervision of instructors and lecturers. These societies contribute to the students' education and organise study groups in subjects of a non-specialised nature.

At the LENINGRAD Shipbuilding Institute, the Director has deputies for the various branches of the Institute's activities such as research, student affairs, etc. The Institute has 40 general and specialised [redacted] chairs.

General [redacted] chairs are those which [redacted] give instruction in all areas - regardless of the field of faculty. They come under the Deputy Director for Training. General chairs [redacted] include:

Chair for Foreign languages;
Chair for Marxism, Leninism, etc.

Apart from these general [redacted] chairs there are special [redacted] chairs, each of which comes under the [redacted] dean of a faculty. For example the [redacted] chair "Theory of Ships" comes under the [redacted] dean of the Shipbuilding Faculty. Three [redacted] professors deal with this [redacted] chair as well as a number of instructors and their assistants.

The ~~S~~pecial [redacted] chairs have their own Institutes. These institutes are laboratories for experimental work. There is one laboratory for electrical installations and electric motors, one laboratory for mechanics and density [redacted]

For the training of its students, the LENINGRAD Shipbuilding Institute has its own [redacted] wind tunnel, which is 35 m long x 5.5 m broad x 3.5 m deep.

The composition of the teaching personnel and the close contact maintained between the Shipbuilding Institute and industry has made it possible for research work to be conducted in a well co-ordinated and productive manner. The members of the teaching personnel are mainly consultants and in some cases deputy heads of departments in other research institutes. The organisation of the research work is straightforward and well thought out. Subjects of research are suggested by industry or the industrial ministries.

The organisation of the research work can take one of two forms:

(a) The teaching staff propose the basic scientific subjects for research. These are discussed and approved by the Institute's Scientific Council (to which representatives from industry also belong) and are then forwarded to the Ministry for advanced technical [redacted] Schools for confirmation. After being confirmed, this type of research is financed by the State.

(b) The industrial ministries or shipyards submit research tasks to the Shipbuilding Institute. The Scientific Council decides whether or not to accept the work. Research tasks which are accepted then become the subject of an agreement between the Institute and the customer. Research work falling into this category is financed by the customer.

Those in charge of research work have the right to accept a fee which can amount to as much as 50% of the fee of a [redacted] School teacher. advanced tech.

The LENINGRAD Shipbuilding Institute issues its own scientific periodical. This periodical publishes contributions from the three faculties. Its articles are of a high scientific standard.

5.4 Questions of organisation and of the research and development tasks.

The whole constructive scope of work from the preliminary project to the serial building plans is undertaken in the USSR by the Central Planning and Design Bureau [redacted] office. There are several bureaus [redacted], each of which specialises in specific types of ships (e.g. ocean-going ships, river ships, fishing vessels etc).

Apart from the main engineer and the corresponding administrative offices, the main constructors for projects also come under the manager of the Central Planning and Design Bureau [redacted]. Apart from the usual constructional departments such as calculation, shipbuilding stores and equipment, machine construction, ships piping and electricity, the main engineer also has a department for technology. The main engineers are each responsible for a project; they co-ordinate between the different specialist departments, the client, the institutes concerned, the Standards Office, the classification company, etc. They thus have the entire supervision of the project.

The above-named design [redacted] departments each come under a main designer [redacted]. The differences of opinion between the main designer [redacted] for projects on the one hand and the main designer [redacted] for the special[redacted] departments on the other hand, who each have different superiors, are described as small and insignificant.

The following are the tasks of the offices:

(a) Theory of the ship[redacted], ship[redacted] equipment, ship[redacted] stores, ship[redacted] engines and electrical equipment, [redacted].

(b) Building technology.

(c) Carrying out of scientific research work for special subjects such as standardisation.

(d) Collation of the results of practical experience and liaison between the different institutes.

Ocean shipping is controlled in the USSR by the Ministry of the Maritime [redacted] Fleet. Apart from the merchant marine, this Ministry also controls Institutes (including [redacted]) dealing with economic and technical questions. (The repair shipyards also come under the Ministry of the [redacted] Fleet.)

Design Bureaus Maritime

The Ministry of Shipbuilding looks after the shipyards for new buildings and it also takes care of the Central [redacted] Planning and Design, the Central Offices for Standardisation and [redacted] Normalization, the Institutes of Technology, the Shipbuilding Experimental Instute, etc. 25X1

The requirement of ships is ascertained in the Institutes of the Ministry for the [redacted] Maritime Fleet and the result of the research is included in the State Plan. The [redacted] Maritime Ministry then gives the order to the Central [redacted] Design Bureau for the planning and construction of the ship. The task then is dealt with carefully by that office. The main measurements, the type of ship, the type of machinery, the speed etc are studied and the order is agreed in detail with the Ocean Fleet Ministry.

The project is then worked out in detail from this order and is given to the Maritime [redacted] Fleet Ministry for agreement. Other interested Ministries then study the plan. After all aspects have been agreed, the plan is confirmed by the client and forms the basis of the contract for the construction of the ship.

At the same time as the plan is being worked out, technological studies are also made. As the shipyard and the number of ships to be built is known in advance, the greatest possible consideration can be given to the shipyard in connection with the number of ships to be constructed. The Central [redacted] Design Bureau is advised by the Ministry for Ship [redacted] Building in carrying out this work. The technological scope of a project includes:

(a) the division into blocks and single sections;
(b) timing plan with target dates
(c) scheme for the order of assembly of the sections;
(d) the welding plan and special studies appertaining thereto;
(e) the building costs.

Until a short while ago, the expenses for the project and construction work were very considerable. The extra expense was caused as the shipyards had to be built up and they had few qualified workers. Since these difficulties have been overcome, it has been possible to reduce the drafting work considerably. The Soviet colleagues are, however, endeavouring to reduce the construction expense still more. On account of the technological work, however, the amount of work done by the office is still very large. The work on the technical plan for a 10,000 ton tanker amounts to about 71 plans which is about the same as with us for a ship of the same size.

After a plan has been authorised, the drafting work is commenced. The first task is the production of a list of material specifications with standard parts; this is partly done on the basis of preliminary drafts. (Thus material planning is not part of the plan.) The exact material standard is calculated after the prototype ship has been completed on the basis of the shipyard's experience.

The ordering of the material according to the lists is done by the shipyard. However, the Central Planning and Construction Office gives sub-contracts to specialist firms for the planning and construction of machines and apparatus, e.g. boilers, turbines etc. Payment for the planning and construction by the specialist firms is made by the Central [redacted]. Design Bureau.

The building Inspectorate of the Shipowners in the House of the Central [redacted] Design Bureau can express special wishes whilst the plan is being drawn up but after the plan has been confirmed, alterations can only be made against payment. Experts of the Shipping Ministry are present for advice on specialist questions.

After the drafts have been prepared and handed over, a construction team of the Central [redacted] Design Bureau goes to the shipyard to advise and ensure that the construction is done in accordance with the drafts. Any constructional errors are rectified on the spot and agreed. The size of this team is between 5 and 30 men according to the size of the project and is led by a representative of the Chief [redacted] Designer

After the first ship of a series has been completed and had its trials, the team undertakes the co-ordination of plans for the series. Apart from the practical value of this work by the teams at the shipyard, it is an excellent method for further qualification of the [redacted]. designers

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The preparation of the technical documentation is also a part of the construction responsibility of the Central [redacted] Design Bureau. The scope of the drafting responsibilities covers roughly that of the plan and in addition there are the instructions for servicing, descriptions of individual systems and complicated machines and drafts of the main reserve parts. Each ship receives one set (of spares) to remain on board and in addition for the first ship of a series, there is one set prepared for the shipowners. 25X1

The carrying out of ships' trials comes under the Quality Control. However, designers [redacted] are present during all the trials. The taking-over groups consist of members of the building management, of the Central Planning and Design Bureau [redacted] and of the Quality Control.

The guaranteed time for delivery of a ship is 12 months and begins when the plan is delivered. Sub-contractors participate in the guarantee but their guarantee is confined to the machines they deliver and not to consequential losses.

On the question of the advisability of working on plans and constructions in Central Planning and [redacted] Design Bureau or of dealing with these tasks in offices of the individual shipyards, it was ascertained that there was no uniformity of opinion on this subject in the USSR. The shipyards want their own office whereas the Central [redacted] Design Bureau want centralised work to continue. The following opinions were expressed by representatives of the Central [redacted] Design Bureau.

As far as possible endeavours should be made to arrange for the planning and [redacted] design of a project to be dealt with by the same [redacted] designers in order to achieve the basic intention of the plans. The designers of the Central D. B. - [redacted] are not strangers to the shipyards but are in the closest contact with them, assist them technically and are sometimes present during the building in order to co-ordinate, guide and, in case of need, to make alterations.

In the USSR on occasions, a project is built at different shipyards (e.g. a 10,000 ton tanker at three shipyards). Central co-ordination is therefore essential. It also happens that important parts of one project are incorporated into a new project, e.g. a ship's body which is successful as a freighter may also be used in a refrigeration ship.

Centralised planning and [redacted] design also enables a great deal of experience to be gathered as the subjects of work are highly specialised. This is not possible at the shipyards as they have very different building programmes. If the shipyards were completely specialised, shipyards offices for construction and planning would be justified.

In any case a central overall planning is considered necessary for preliminary plans, technical drawing-up of tasks and for the keeping of a uniformed line in shipbuilding.

The Central [redacted] Design Bureaus in the USSR are specialised; each [redacted] has its own technical subject (e.g. fishing vessels, freighters, tankers, passenger ships, etc). In future the Central [redacted] D. B. at NIKOLAYEV will work on freighters whilst the LENINGRAD [redacted] Bureau will deal with tankers and passenger ships.

The trend is toward [redacted] specialisation [redacted] according to economic area (Wirtschaftsraeume) at LENINGRAD and the BLACK SEA. LENINGRAD will undertake the building of 25,000 ton tankers while 10,000 ton freighters will be constructed at the BLACK SEA ports (NIKOLAYEV and KHERSON). If at a later stage the shipyards do specialise, the planning and working drafts can be done in offices belonging to the shipyards.

Influence on the development of sub-contracting industries.

When planning a ship, the Central Planning and [redacted] Design Bureaus give orders to specialist firms for the development of the necessary machines and equipment when such are not available in the desired form or are not in accordance with the latest technical development. The order is placed by the Central [redacted] D. B. Office and fulfilled by the specialist firm.

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List of tasks and the carrying out of research work.

Tasks to be undertaken are generally decided upon by the research institutes, the central construction offices and the shipyards. Subjects for research are generally collected by the competent authorities and are checked by a technical committee which consists partly of colleagues from other undertakings or institutes and partly from their own office. Before a subject for development or research is submitted, a calculation of the profitableness must be made so that the advantage to be expected can be considered when the application is judged. The subjects to be included in the annual plan for the following year have to be passed to the Ministry for authority. They are examined there again in detail before they are confirmed. After an undertaking has received the necessary confirmation, the technical committee is called together and distributes the task to the departments and laboratories concerned. The subject is then worked on in different stages which are agreed before a start is made. When each stage has been completed, a report is made and the technical committee decides whether to continue along the lines originally planned or whether any alteration is considered desirable.

The distribution of tasks is arranged similarly in the Central Planning and Design Bureau [redacted]e for maritime [redacted] Shipbuilding. The list of tasks is worked out by a committee at the Ministry of the Merchant Fleet [redacted] in co-operation with the Institutes. The Central [redacted] checks whether these are practical. The working out of the preliminary and technical plans is done under the supervision of the client.

5.5 General questions of shipyard organisation.

Organisation of the shipyards.

The structural organisation of the five large shipyards visited was on the whole the same. Such individual differences as were observed were due to the size of the organisations or the type of orders undertaken.

The following organisation charts are attached to the report as an example of the structural organisation of a large shipyard which has large machine construction workshops, foundries, etc apart from actual shipbuilding production: .

Shipyard "NOSSENKO", NIKOLAYEV.

(a) Plan of organisation of the whole enterprise [redacted].

(b) Plan of organisation of the Chief Engineer (Technical Director).

(c) Organisation of the technological offices:

(i) In addition, the plan of the technological method for the mass production of fish catching and [redacted] ships. processing

(d) Organisation plan of the Dispatcher organisation.

(e) Organisation of the Quality control.

(f) Plan for liaison within the enterprise [redacted].

BALTIC Shipyard, LENINGRAD - Management Organisation.

Attention is drawn to the following special features or differences from the usual organisation of the GDR shipyards:

(a) Direct subordination under the shipyard manager.

The number of subjects for which the Shipyard Director is responsible is still comparatively large in spite of the fact that endeavours to effect concentration and simplification can be noticed and these have sometimes been achieved. Thus, in the case of the "NOSSENKO" Shipyard, apart from "T", "F", "K", "P" and "A" Depts, the Quality control, the wharf extension dept and the ships' delivery group are subordinated to the director. The Division "A" is subdivided into "work and pay" and "social questions" (construction of houses, social amenities etc).

The technical director (chief engineer) is always the first deputy of the shipyard manager.

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Apart from the production preparation departments [redacted], Technology, Main Mechanics etc which are likewise subordinated to him in the DDR, he has in addition direct control of the production depts which are subordinated to him.

Furthermore, the managers of the individual projects are subordinated to him. The production manager, who is directly subordinated to "L", only has indirect influence on the progress of production by working on the monthly operational production plans for the divisions and departments and through the control of these through the dispatcher service which is subordinated to him and which, at the same time, controls internal transport within the organisation.

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The organisation of the production preparation by "F" is arranged through the operational monthly plan, which has to be passed to the divisions and departments on the 25th of each month detailing hours, quantity and money. Supervisors then transform the plan for shorter periods of time, tens of days and days. The works report back with material graphs, etc by 28th of each month. After this report has been studied by "F", it is handed over to the dispatcher service to supervise its completion.

(z)

There is no central planning dept [redacted] directly subordinate to "L". "F" co-ordinates the overall planning for production and the allocation of tasks (see also para 6 - questions of planning).

Generally speaking, it is considered that the present organisation of the scope of responsibility of "T" and "F" could be improved. It is intended, as in shipbuilding in the DDR, to relieve the technical director of responsibility for direct questions of production and to transfer from "T" to "F" the direction of the production divisions for the direct organisation of the progress of production but it is not yet clear whether "F" will continue to be directly subordinate to "L" or will in future be subordinate to "T". Accordingly, the project managers as well as the shed and division managers will be subordinated to "F" instead of "T". It also remains to be settled whether with the extension of the purely production planning work the central planning should be taken away from "F".

and design The "Kobü" (co-ordination office), which is subordinate to "T", does not plan ships [redacted] independently. Its main task is rather to supervise the design [redacted] of the vessels under construction according to the plans of the Central D. [redacted] B. and to make alterations to drafts. The second task of the [redacted] Design Bureau is the [redacted] design work on the shipyards own installations.

Shipyard managers are generally of the opinion that a change is desirable or necessary in the Central D. [redacted] B.. They all demand that the design [redacted] itself and especially the preparation of the working drafts should be transferred to the shipyards in order that the technological facilities available can be taken into consideration more. There is, however, no uniformity of opinion on the subject of D planning. Some consider that it would be best to dissolve the Central [redacted] altogether, doing the planning also at the shipyards; some consider planning or preliminary planning by the Central D. B. [redacted] as necessary.

Two plans showing the structure of the Central D. B. [redacted] are attached.

The sphere of responsibility of Division "K" corresponds to our own organisation. However, the bookkeeping is subordinate to the business manager. The direct subordination of "B" to "L", which used to be usual in the Soviet Union, has been dispensed with.

After the split of Division "A" into the two departments "Wages" and "Social questions", the personnel manager (P) is directly subordinate. At the NOSSENKO Shipyard which, unlike the LENINGRAD Shipyard, has its own training department, this department is subordinated to "P". The amalgamation of "P" and "A" is under consideration, to avoid overlapping.

The organisation of the production division of the shipyards is the same as ours. There are separate divisions managed by a shed or division manager as e.g. in the BALTIC Shipyard:

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(a) Shipbuilding - Preparations, construction of parts, construction of sections, [redacted] burning & welding work.

(b) Slips.

(c) Equipment - Engine fitting, pipe-laying, electric fittings, woodwork, painting, insulation, tackle (towline and slip).

(d) Machine construction - forgery, mechanical workshops, boiler making, propellor construction, engine building.

(e) Foundry.

The [redacted] shop or division managers get their instructions from "T", their plan tasks from "F" and plan control by "F". The project managers are at present the co-ordinators between the divisions and the dispatcher service of "F". The superintendents are subordinated to the division managers. The foremen have authority and are clothed differently.

Order of work and shift system.

With certain exceptions, it was noticed that manufacture went very smoothly. At some shipyards, the successful endeavours to keep order at the place of work and in the workshops and the intensity of work were conspicuous. There are plenty of foremen - according to several statements these are allocated as follows:

For 20-25 men	-	1 Foreman [redacted].
40-50 men	-	1 Techn[redacted]ologist (A technician writes out work tickets in the workshop stating the times.)
45-50 men	-	1 Quality controller.
2-12 men	-	1 brigadier [redacted].

The supervisors appear to have more time than in the G[redacted]DR to be occupied in giving instructions and controlling the work. They have not so many additional responsibilities such as obtaining material, placing working orders etc.

Work is based on a 46 hrs week but a change to a 40 hrs week is planned. There are no half Saturdays in the normal shift as with us. The midday pause is generally one hr.

The loss of work in the BALTIC Shipyard = Illness 4.2%, Holidays = 6.2%.

The organisation of workers in the BALTIC Shipyard is as follows:

Production workers	-	74.5%
Technicians, businessmen and management	-	16%
Other employees	-	9%
Apprentices	-	0.5%

The shift system varies considerably. The available capacity of the shipyards is generally subject to limitations through supply of materials and labour so that working in several shifts is not necessary on any large scale. Main production is done in the normal shift. Shift work is only done for bottleneck work or for work in preparing for production.

5.6 The organisation of the technical field and individual problems of construction and technology.

The limits and the organisation of the fields of activity that are controlled by the technical "Head".

In all shipyards, the Head Engineer is the first deputy to the Manager. He has a deputy for technology and a deputy for metallurgy. In addition the following are subordinate to him:

The [redacted] Design Bureau;
Chief mechanic;
Head of the Power Plant;
~~The technical office~~;
The foreman for building projects;

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chief

There was no clear division of authority in the ADMIRALTY Shipyard and in the BALTIC Shipyard in LENINGRAD between the [redacted] Engineer and the Production Head. For instance, in the ADMIRALTY Shipyard, the Production Head controlled the production workshops.

In the NOSSENKO Shipyard in NIKOLAYEV and in the CHERSON Shipyard, the organisation was clearcut - the workshops being controlled by the [redacted]- Engineer. In neither of these two shipyards was there a separate [redacted] of Production; instead his duties were carried out by the Head of the Central [redacted]. Responsibility for the checking of the quality of the work rested on the Works Manager. The responsibility for technical checking was placed on the Technical Head in the NOSSENKO Shipyard; in the others this responsibility fell on the Works Manager.

Chief

It is recommended that as far as the technical field is concerned, the GDR should follow the pattern of the NOSSENKO Shipyard.

Technical equipment in the shipyards.

It was noteworthy that all innovations, whether of new tools or new methods of work, were to be found simultaneously in all the shipyards. This can be explained by the fact that new methods are not developed in the Institute for Technology in LENINGRAD. Here they are tested until they are ready to be generally introduced.

In the ADMIRALTY Shipyard and in the BALTIC Shipyard, the optical method of tracing was used. It must however also be stated that parallel to this system, ships were being built after having been drawn and laid out completely in drawing lofts.

In reply to a question at the ADMIRALTY Shipyard as to the date at which one could expect the optical system to replace completely the drawing loft system, we received an evasive answer. They said, possibly 1959. They have the same problem as ourselves, namely that the drawing loft is needed for frame designs and for the box framework in the production of the hull.

As long as the optical method cannot be used to replace completely the drawing loft method, it cannot be considered economical.

On almost all the shipyards, use was made - but only to a limited degree - of optical gas-cutting. At each shipyard an optical gas cutter was available which worked on patterns of a 1:10 scale. The equipment and the drawings were kept in an air-conditioned room so that the drawings did not warp and the photo-electrical procedure was not affected. The optical gas cutter did not cope with more than 10-15% of the total gas cutting. A final decision cannot yet be given as to whether the optical method of gas cutting or the use of a cutting pattern in the ratio 1:1 is the more economical.

The optical cutting method is, however, definitely recommended for use in the GDR shipyards.

The working of plates, i.e. the cutting and forming of plates, was carried out in all shipyards with the same equipment as we use in the GDR.

We should mention that shipbuilding forging presses in use in the Soviet Union are better than those in the DDR. They were modern machines of English manufacture. A new arrival from the Institute for Technology was a machine to bend plates, working on the principle of smoothing (Prinzip der Glätte). This machine is particularly useful for shaping plates which have to be shaped on all sides - it can, however, be used only for sheet metal up to a thickness of 12 mm. For the production of flat sections, all shipyards used the magnetic holding device that has recently been developed by the Institute of Technology - these devices were available in large numbers and we strongly recommend their use in the GDR shipyards.

The production of walls of light construction was interesting. These were provided with longitudinal bending, even for the outer walls. They were not, however, to be found in all types of ship.

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In addition, all shipyards contained an automatic welding machine [redacted] in the assembly area for the production of "T"-shaped supports. About 150 m were produced with this machine per shift and metal from 16-20 mm thick could be handled by the machine without the edges being bevelled. This machine can also be recommended for large DDR shipyards where many "T"-shaped supports have to be made. All joinings along the flat sections were welded together in the shipyards with the automatic welding machine that is already known to us. For fillet welding, use was made of [redacted] semi-automatic welding machines, as is also the case in the [redacted]DDR.

An automatic welding machine was used on the slipway for the welding of vertical joints.

Particularly good production methods and appliances were used in the manufacture of pipes. The bending of pipes is effected up to about 70% on the pipe bending machine without the pipes being filled. As a rule, each shipyard had two types of bending machine for steel pipes - one for pipes up to 400 mm in diameter (pipes up to 515 mm in diameter have already been bent on this machine) and a smaller one for pipes up to 200 mm in diameter. These machines work on the same principle as those that we employ.

Automatic machines were also available for the production of copper pipes.

In this department there was also another machine which was used to make incisions and flanges in copper pipes. Coiled or spiral pipes were welded on a butt welding machine. Pipes were warmed only with an electric heating oven which works on high frequency. The production of folding pipes (Faltrohr) is also carried out with high frequency heating. It needed 2.5 minutes for a fold to be produced in a pipe of 325 mm in diameter and 9 mm in thickness.

Pipe flanges were almost entirely welded with either fully automatic or half automatic machines.

Special turning devices had been developed which were driven either by machine or by hand. It was also particularly interesting that in the series production of ships the shape of the pipe was not made by having a pattern but by using a projection device. This device was not, however, in use in all shipyards and the delegation could not determine if it is economical or not.

It is strongly recommended that the type of pipe bending machine and the heating installations that are used in the Soviet Union should be brought into use in the DDR shipyards. All these machines are of Russian manufacture and can therefore be obtained.

With the exception of fishing and fish processing [redacted] ships produced at NOSSENKO Shipyard in NIKOLAYEV and of the tankers and freighters being produced at KHERSON, all production methods in the Soviet shipyards are the same as those used in the DDR.

All the shipyards had 75-ton luffing cranes in addition, naturally, to the 20-ton and 30-ton rotary-tower cranes.

The technical equipment of the slipways is moved by luffing [redacted] cranes.

Automatic welding was used in about 80% of the construction of sections. In the welding shops [redacted] at the ADMIRALTY Shipyard at LENINGRAD and also in the BALTIC Shipyard there were central installations, [redacted] each for 16 welding [redacted] joints. The automatic machines had a pneumatic device which removed welding powder.

A special workshop area was allotted in the NOSSENKO Shipyard at NIKOLAYEV for conveyor-line assembly methods to be used in the construction of fishing and fish processing [redacted] ships. The area in which the ships are constructed is laid out according to the principle of "progressive operations" and so arranged that the finished article arrives at the place where it is needed at the right time. Superfluous transport is not seen at this shipyard.

Similar methods are used in the shipyard at KHERSON for 10,000 ton freighters and tankers. The first tanker was delivered in 1954; since that time 15 tankers have been built.

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A final decision as to whether this method is economical in large scale shipbuilding is not yet possible. According to the director of the CHERSON yard, a final judgment would be possible in 1960.

Organisation of Quality Control.

delivery

Quality control is the responsibility in all shipyards of the yard manager. For every 40 workers engaged in production, it is estimated that one controller is needed. The testing and [redacted] dept at the NOZSENKO Shipyard is under the control of the yard manager.

We have no recommendations to make in this connection for changes to be made in the control system in the DDR.

Compiling of documentation.

delivery

The scope of documentation in the Soviet Union is the same as in the DDR. The compilation and [redacted] of documents is undertaken by the department called the "[redacted]" department.

The use of different types of steel for shipbuilding. Delivery & Testing

The use of corrosion-resistant steel, e.g. for propellers.

A particular type of steel, Type 09G2, has been developed for shipbuilding. It is already being used in the construction of tankers, whaling supply vessels and whaling ships. From 1958 onwards only this type of steel will be prescribed.

The steel is easily welded, carbon content 0.12%, manganese 1.5%, yield point 30 kg/mm^2. The steel is shaped when cold.

A "Nirosta" steel has been developed for steel propellers and is designated 1H 14ND. These propellers are being produced at the BALTIC Shipyard. The entire propeller is not moulded in one piece but is so made that the blades of the propeller can be screwed on.

Use of light metal.

At the shipyards that were visited by the delegation, virtually no light metal at all was in use.

Use of plastics.

In the Institute for Technology, a special department was engaged in the development of plastics and in the study of their uses. The amount of plastic at present being used in ships under construction was too small to be worthy of note. The types of plastic used in the Institute are also known in the DDR.

Normal materials used for insulating ships' holds, particularly in fishing vessels.

In general, EXPANSIT (a pressed cork product) is used but we do not recommend it as it is easily inflammable. In addition, mineral felt was used.

In the Institute, a new insulating material is being developed that is completely fireproof. Components are mica and asbestos fibre. This material is, however, very heavy and has a poor coefficient of thermal conductivity. Otherwise, materials that are known to us, such as VINOFLEX and PIATHERM, are used. For inner rooms, spun-glass plates are used. A plate made from wool waste plus 15% wood fibre and impregnated against insects is used on some ships of the inland fleet.

System of technological preparation of production. Design Bureau

The shipyard also receives from the Central [redacted], at the same time as the project, the technological requirements. These are studied at the shipyard, taking into consideration the number of ships to be built. The technological project contains the division into sections, instructions for the technological processes as well as the production methods to be used.

la Computation of Costs For

The technological project also contains the [redacted] the construction. It is broken down into its various sections and gives the cost[redacted] for the materials to be used, including the wages to be paid. To these are then added the cost of the individual machines, general shipyard costs cost of foreign products, special costs, risk and profit.

Wages index: 3 roubles per man and hour + general costs = 201%.

In accordance with the technological project, typical group plans are drawn up in the shipyard by the Head Technological Section as in the GDR to deal with specific methods of working and with the necessary working instructions. 25X1

The shipyard receives:

(a) the technological plans;
(b) working instructions;
(c) the norms of material to be used;
(d) drawings for special tools.

In general, they consider that one technologist is necessary for every 50 production workers.

The type of plans used are similar to those used in the DDR.

<u>The amount of hand and automatic welding.</u>

The proportion of automatic welding in the construction of ship's sections is 80% and goes down as low as 20% (for example, at the shipyard of the "61 KOMMUNARDEN" in NIKOLAYEV, where whale-catchers are produced).

<u>Methods for the construction of sections.</u>

In the main, most work is carried out using flat sections; use is made of volume sections entirely in the construction of fishing and factory ships and partially in the production of whale catchers - but the sections are not completely assembled.

A separation is made on the slipway between the "island" and the "pyramid" methods. In the "island" method, the assembly is begun on the slipway at three separate points - forward, aft and [redacted] - and work goes on equally at all of them. In the "pyramid" method, work begins amidships and proceeds from there fore and aft. amid-ships

<u>Extent of building equipment.</u>

In general, the same appliances are used as in the shipyards in the DDR. Innovations such as the magnetic holding device have already been mentioned above. The apparatus in use for the construction of ship's sections are decidedly more simple and primitive than those in the DDR. the sheer and thwartship convex arch

At the NOSSENKO shipyard they were engaged in developing a universal appliance for decks. This consisted of a normal base or substructure and many adjustable spindles, so that it could be adjusted for [redacted]

In the mechanical workshops, an original device was used which consisted of 5000 separate parts. The existence of this equipment made it possible to execute precise single part production which would otherwise only have been possible by using a [redacted]. jig drill.

<u>Methods in use to protect the [redacted] surfaces.</u>

be applied at In general, Aethenol paint EKA 15 was used. [redacted] This paint [redacted] can [redacted] temperatures down to minus 20°. Instead of red lead, [redacted] red ocher minium is added as pigment. In the Institute for Technology, work is going on for the development of new varnishes. A white emulsion varnish that is soluble in water is being developed. This has the advantage that it can be sprayed on, even in enclosed rooms, without the workmen having to wear a mask. In addition, the Institute was working on the development of a thermo plastic paint for under-water purposes. The paints that are produced in the GDR, particularly the under-water parts, are rejected by the Institute. We were shown examples of tests which proved clearly that our paints did not fulfil their aims. It is strongly recommended that the German paint industry gets in touch with the LENINGRAD Institute and compares experiences with the Russians.

<u>Methods used for de-scaling and de-rusting.</u>

De-rusting, as in the GDR, is carried out both by machinery and by hand. Beaters and brushes are used (all driven by compressed air). There are no

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new gadgets in use in the Soviet Union - all the equipment that is known in the DDR.

Two methods are used for de-scaling:

shot blasting G
(a) the steel [redacted]) method, known in the [redacted]DR, and
(b) the chemical method.

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Steel Shot [redacted]: Special blades [redacted] have been developed in the Soviet Union which are said to last for 170 hours.

The type of machine used corresponds to the kind used in the G [redacted]DR.

The chemical method is used on the BALTIC shipyard, the ADMIRALTY shipyard and the shipyard of the "61 KOMMUNARDEN". The plates are first dipped in a bath containing 20% muriatic acid solution to which has been added (to speed up the process!) a 5% KS solution. As a rule, 4-8 plates are put in one bath. The time for the reaction to take place is $1\frac{1}{2}$ hrs, with $2\frac{1}{2}$ hrs for steel alloys. Then the plates are sprayed with a 5% soda solution. This is followed by washing the plates in a bath containing 19% alcohol and 24% phosporic acid. Finally, the plates are dipped in a phosphate bath.

The waste water from the de-scaling installation is not dealt with or neutralised in any particular way but is drained away into the river [redacted] and [redacted] the harbour basin.

This chemical method of de-scaling is particularly recommended for use in the DDR shipyards.

5.7 Production matters.

Organisation of the production process.

With the exception of the shipyard in CHERSON, all the shipyards are basically major shipyards and are laid out in a manner that fits in with the way the production processes are organised.

Production is controlled through an office that deals with effective planning, gives orders for the execution of the work and fixes the date at which the work must be completed. (Dispatcher office).

The production management is immediately subordinate to the Technical Director. It is to be noticed that the duties of the technical director are as a result of this given a different slant, since constructional and technological details for new types of ships that are to be produced come from central offices.

The organisation of the production plants resolves itself in the main into the following two spheres:

(a) the construction of the ships themselves;
(b) the completing or finishing of ships.

Concerns with special tasks had corresponding additional spheres of production. For example:

Firms producing engines dealt also with:

Production of [redacted]; Fittings
[redacted]; Forge
Mechanical workshop;
Boiler works and propeller [redacted]; shop, including Foundry
[redacted]

(Mass production is mainly carried out in these workshops).

Inspection is the responsibility of the Design Bureau [redacted], as is also the control of tests.

The shipbuilding division consists of:

Cutting;
Construction of ship's sections using [redacted] automatic and [redacted] Semi-
automatic welding;
Slipway.

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The "finishing" division consists of:

Production of pipes;
Electrical assembly;
Carpentry (furniture and assembly of anything to do with carpentry);
Production of engines (on land).

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The division dealing with the construction of engines (on board).

The term "machinist" is unknown in the shipyards and this type of personnel is provided by the customer.

The department for "special work" deals with:

Painters;
"Insulation" workers;
Scaffold[redacted] builders;
Tackle, handlers
(Responsible for all transport within the various concerns).

This department is so organized [redacted] in some shipyards that possible bottle-necks at the place of work can be avoided by changes within the department.

The production departments, in strengths varying from 70-450 - according to the type of production - are directed by a works engineer as Head of Department.

Foremen control groups of 20-30 workmen and a proportion of them are qualified engineers.

"Brigades" are organized only [redacted] when complicated work has got to be carried out, e.g. construction of sections. In this case there is a contract giving value and time allowed for the entire job plus a contract for the welding for the entire job. "Brigade" strength is 10-12 men.

[redacted] Shop senior technologist with technologists.

Experience has shown that it is best to have one technologist for 40-50 production workers on each shipyard.

Quality control - from experience: 1 controller for 40-45 workers.

The foreman's office, in which the technologist and the workshop clerk are to be found, is in the sheds immediately by the production area.

Skilled workers do not in many cases only have two professions but often two additional professions (shipbuilder, welder, carpenter.)

Personnel structure:

Production workers	74%
Engineer and technical staff	16%
Other personnel	9.5%
Apprentices	0.5%.

Shifts: Work is organised on a 2-shift basis (For Full capacity operation)
4.6% of the entire working time is allowed for running repairs.
Weather conditions are not considered in the plan.

Shifts are organised as follows:

85% - 1 shift
15% - 2 shift
- 3 shift (only [redacted] machines that relieve [redacted] bottlenecks are operated.)

In the main the building industry, with few exceptions, is organised without shift work. Only bottle-necks are dealt with on the 2 or 3 shift system.

Piecework:

(a) The proportion of pieceworkers is 60-65%. The average fulfilment of norms is 170%.

(b) A new system of pieceworkers has been tried in the ADMIRALTY shipyard since 1955.

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8 wage groups have been formed in this concern.

The coefficient of Group 1 & 8 is 2.8

The proportion of pieceworkers has been reduced to 35%. 25X1

By setting realistic norms, the average norm fulfilment is 120%.

Piecework has only been retained when an effective system of assessing the work is possible. At the same time norms, which were technically calculated, were introduced and are operated without additional payment.

Basic payment was increased by 40%.

Piecework is being used in the following departments for similar work processes:

Adjustment department (partially);
Welding department;
Section construction department;
Mechanical workshop.

For the remaining workshops engaged in production, a type of premium payment is in use. Here the fulfilment of the plan of the department or of a smaller unit is taken according to the key of the plan as a basis for evaluation.

A basic condition is the preparation of the task for each day's work. The calculation for the payment of the premiums takes place daily.

Premiums are laid down specially for each group or professional sphere. For example, burners receive 20% of their basic wage as a premium when the plan is fulfilled.

If the entire department or professional sphere over-fulfils its plan, then it receives a special premium at the end of the month. The calculation is based on the fact that the terminal date for finishing the plan, the labour plan, the finance plan and the lowering of factory costs must all be realised. If a task is not fulfilled, reductions are made.

For every percent that the plan is over-fulfilled, the department and the people responsible receive a 2% premium. The premium is paid out of the wages fund. The basis for planning is basic pay plus 20%.

The result of this change was a significant increase in productivity. This method is at present being tried in 15 works.

Planning and control of the processes of production:

Planning is worked out on a yearly basis for the entire works by the "production-economic department". The production management works out the organisation of the production processes for the spheres and departments dealing with production in quarterly and monthly tasks.

Operative monthly planning.

The 25th day of every month is the day on which the preparations are reviewed for the following month's production.

The orders from the Quarterly Plan together with amendments are forwarded by the Production management to the yard or factory two days beforehand. The foremen then divide up the first ten days' work between the brigades and/or teams.

The availability of the necessary supplies is checked and any suggested alterations for the entire month's work are submitted to the Production management.

The division of work for the second and third ten days of the month is carried out independently by the foremen.

This plan is agreed by the Works Management on the first day of the month. When the quarterly plan is approved, the first month in the quarter is automatically approved at the same time.

The technological plan is so constituted that the time to be taken, the rate, the technological starting time and finishing time can be worked out for the different specialist jobs and processes.

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Thus a 10,000 ton tanker is shewn as having 2,300 "building groups".

The "Dispatcher Dept" controls production in accordance with the main time-table schedule plan and the dates laid down in the Operative Plans.

The work of all departments is thus controlled, including that of the department dealing with the preparation of production in accordance with the following factors:

(a) the completion date;
(b) percentage fulfilment of monthly production quota;
(c) fulfilment of the works plan.

The fulfilment graph of the main sections of the works is kept in the Works Manager's office and is kept up to date by the "Dispatcher" so that the Works Management is at all times in a position to put right any deviations from the plan.

The Production Management, including the "Dispatcher" in an undertaking with a production turnover equal to that of the WARNOWWERFT but producing 4 times the number of types of ships, is composed in the following manner:

11 members of Production Preparation and Planning Depts;
6 members of "Dispatcher" Dept, including 3 duty engineers.

At the same time the Production Management sees to the planning of the procurement of stores and equipment and to the delivery of articles produced in the time scheduled.

The Quarterly Plan.

As already mentioned, this is entirely the responsibility of the Production Management. An exception to this rule is to be found at the CHERSON Shipyard, where all planning is done by the Planning Dept. The Construction Manager takes the place of the Production Manager, as only one type of ship is produced over a relatively long period.

Planning is conducted in such a manner that one month before the beginning of the Quarter, the departments share out the various tasks to be done. These tasks are then discussed in the department and are divided up amongst the brigades and groups.

This distribution of work is then submitted back to the Production Management where it is approved and 5 days before the beginning of the Quarter, the targets and method of fulfilling them are reported to the Works Management. The Works Management issues its orders and approves the plan. This plan is binding on all departments of the works, including the departments for Construction and Supply of Materials.

The fulfilment of the Finance Plan is worked out at the beginning of the year for the whole year by the Commercial Dept. The Production Management has to see to it that the economic targets are reached.

Composition of Quarterly Plan.

Job numbers and target dates;
allotment of hours;
payment units for the establishment of values and target dates;
dates for having material and equipment available.

Assurance of supplies of mass produced parts. Design

For all new types of ships to be constructed, the Central [redacted] Bureau lays down for the various mass production works involved, instructions which will ensure the availability of spare parts where and when they are needed. At the same time, the Central [redacted] Design Bureau supervises the carrying out of these integrated instructions as well as supervising selection of types of parts and standardisation.

The classification and standardisation work designed to improve integration is carried out by a separate department in the Central [redacted] Design Bureau.

The planning of integration is so arranged that in May of the current year the entire production plan, including the integration plan, is submitted

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to the Ministry. The order for deliveries of spare parts has by then already been received by the suppliers. In cases where technical questions have not yet been cleared, an application is made for booking the production capacity of the supplier factory.

The Ministry checks the delivery dates and the delivery capacity of the suppliers industry. When the plan is communicated to the shipyard, the Ministry has already confirmed that the production capacity at the supplier works is available. This is in about September. The next step is that a contractual agreement is drawn up between the shipyard and the supplier works, laying down the target dates stipulated in the plan.

In the USSR shipbuilding industry, there are no agreements comparable to those laid down by practice in the DDR. When things go wrong, the cause of the trouble is investigated. If the supplier is found to be at fault, then he must bear the cost of repair, even if the fault is discovered over a year after delivery.

5.8 <u>Finance accounting</u>.

During the course of the delegation's tour, accounting could not be dealt with in sufficient detail.

The expressed intention of carrying out a comprehensive study of accounting at Soviet shipyards could not be realised.

<u>Reasons</u>.

(a) The composition of the delegation was such that a far greater interest was taken in technical matters; as a result, insufficient time was left for a thorough study of accounting.

(b) The places visited were not prepared for dealing with questions on methods of account. Only in LENINGRAD was it found possible, when paying a second visit to the two shipyards, to put a few superficial questions.

<u>Organisation of accounting</u>.

During the tour, no opportunity was found for getting to know the organisation of accounting, the applied methods or the extent of mechanisation.

shipyard

Only in one shipyard (NOSSENKO [redacted] in NIKOLAYEV), a five minute inspection of the "HOLLERITH" machine was possible. When asked for a copy of a used and an unused form, verbal agreement was given that we should have them but, in fact, we never did receive any. In no shipyard were details disclosed of the composition and strength of the Accounting Depts. From what we were told we gathered that the bookkeeping departments, in some cases, work manually; in certain shipyards are entirely mechanised and in the biggest shipyards "HOLLERITH" machines are installed.

The structure of the Accounting Depts was much as we had imagined it to be; at most, only 3 departments were named, as follows:

Capital investment

Finance Bookkeeping (includes [redacted] accounting);
Wages Bookkeeping;
Materials Bookkeeping.

The departments are centralised in the majority of cases. Only the Wages Bookkeeping Dept is decentralised.

Capital Investment [redacted] <u>accounting</u>.

Only at one shipyard was it found possible to talk about evaluation of inventory, of capital investment [redacted]: it was not possible to discuss in detail. In general, a permanent inventory is preferred to a yearly one. of capital investments

<u>Materials bookkeeping</u>.

This is not coupled with material allocation. On the whole, the organisation of this department was as we had imagined it to be.

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<u>Wages bookkeeping</u>.

The system of Brigade Wages accounting in use in certain GDR shipyards until 1955 was found to be in use in nearly all Soviet shipyards

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This leads to the conclusion that in Soviet shipyards, an uncomplicated form of wage accounting for brigades and work collectives is preferred, despite its inherent disadvantages.

It would be wrong to conclude that the system in use in DDR shipyards whereby payment is made on the principle of direct compensation for the individual's effort, should be condemned.

In general, the principle is followed that both works instructions and administrative activity should be reduced to an absolute minimum. Naturally, in this connection, signs of uniformity cannot be avoided, even if the value of the work carried out in the distribution of total wages is set against the individual workers of each works' contract.

A partial difference has appeared in the experimental section of the ADMIRALTY Yard in that piecework is only allowed on jobs for which purely technical working norms can be set.

Experiences gained at the ADMIRALTY Yard merit their being carried out at a later date in the DDR, insofar as they concern payments for time wages and piecework.

Cost accounting.

Planned cost accounting as laid down in Article 25 of the DFW is not applied. The laying-out of planning costs is not done by the bookkeeping department but with the help of the accounting system of the planning-economy department.

A register of planning failures is kept and their effects are examined later. Evaluation is also conducted by the planning-economy department.

A Works account as known to us does not exist. The organisation of the method of calculation was made known to the delegation as follows:

Direct costs; materials; wages; Works costs; miscellaneous costs; special costs.

Evaluation of the results of the accounting system.

Each month the accounting committee of the works meets under the chairmanship of the shipyard director and scrutinises the state of the fulfilment of the plan in each of its separate parts.

Apart from this meeting of the accounting committee, detailed assessments are only carried out in various departments when individual parts of the finance plan have been exceeded.

The method of presenting accounts from the lower levels of the yard upwards, as is practised in the DDR, was not in evidence. Particular checks of the non-producing departments only take place when the planned amounts for the department concerned have been exceeded.

Finance Plan.

Only very general information could be obtained on the budgetary plan. The conversation was limited to settlement days and turnover statistics.

Long term single part production.

The principle that was employed in the former SAG (also at NEPTUNWERFT) of calculating long-term single part production is also practised at the present time in Soviet shipyards. The technical production position, expressed in production percentage in relation to the hours of labour used, is estimated and compared with the previously calculated basic value.

A re-introduction of this system into the DDR is not recommended.

The factors concerning imprecision are very considerable and can be the cause of grave mistakes in balancing the accounts.

It is noteworthy that the discounting of products, which count as long-term single part production, ensues after 86 manufacturing stages. The smallest stage is about 1/2%, the largest about 6%.

No clear picture could be obtained of the methods of financing projects which are represented in long-term single part production because on the one hand, every building stage is discounted and, on the other hand, the customer is only debited at the time when he takes over the ship. 25X1

Probably they adopt the method of claiming credits from the appropriate branch of the bank.

In all shipyards in the Soviet Union, the "realisation" principle is adopted, i.e. the sales price of goods that are delivered only appears in the bookkeeping department at the time when money is received at the bank.

Day Book order system.

The day-book order method was used in none of the shipyards. In general this method was considered to be a retrograde step - probably because it is only known in the manual form.

The way individual questions on accountancy are treated and above all the possibilities which were provided for an exchange of experiences in this specialist field, may be the reason for which it is impossible for one to speak of really new knowledge.

The pieces of information that we have collected, of which only brief mention can be made, have made possible certain comparisons with the development of accountancy in the DDR shipyards and have confirmed that the way that we have followed is the right one.

5.9 Specific questions of machine construction

The explanation of basic points in the construction of Diesel engines did not show anything new to the GDR. It was ascertained that to date engine development in the USSR has been based only to a small extent on a standard type and it is not possible for their basic types to be put to various uses. A possibility to speed up production is thus lost although present production figures are normal.

The engines made in the "RUSKI-DIESEL" Works in LENINGRAD do not give the impression of being especially advanced in their construction. The faster running engines made by the DIESEL Engine Works in CHARKOV, which were seen at some shipyards, shew a higher standard. Amongst them should be noted a two-stroke opposed piston engine with 10 cylinders and 2 crankshafts for the Diesel and electrical powering of ships. This engine produces 1800 hp at 600 revs/min. The drawback of 20 pistons and working parts to each engine is itself taken into consideration in the powering of the ship.

Other advancements (that is, technological methods not known in the DDR) were not noticeable in the construction of Diesel engines, except for the production of a cast iron crankshaft. It seems that the USSR has had more success than the DDR in the use of Keramic plates for precision work.

The production of essential engine parts by welding has not been adopted. The foundries use in the main electric furnaces [redacted] for the production of high quality cast iron and with induction furnace [redacted] for the smelting of mixed metals. The handling of materials in a pre-heated state occurs with great frequency. To be noted is the use of the lost wax [redacted]" method used in the production of precision castings [redacted] in quantity, which is used in numerous shipyards.

The examination of completed parts by X-ray (or using radio-active Isotopes) is known but is hardly used. (When used, this method is used in the main for the examination of crankshafts). The lack of protection against rays is thus not felt so much as in the GDR.

Every engine is subjected to examination on a test bench. The type of examination, the time taken for running-in and the sphere of measurements taken are approximately the same as in the DDR. In the case of installations with more than one engine and gearbox, the engines are tested singly. The gearbox is merely subjected to "running-in" without a load.

The use of crankshafts made from modified cast-iron is being controlled in the USSR. The fitting of such crankshafts into ships' engines is at present only in the trial stages. For the manufacture of this type of crankshaft (by magnesium inoculation [redacted]) the foundry at the "RUSKI-DIESEL" Works has been fitted out temporarily. The method of production and works' experience will be made known to the GDR through TWZ [redacted] channels. (technical-scientific cooperation)

The use of welding as a finishing process for important building parts is not practised. This naturally also applies to the use of [redacted] welding (submerged-arc) plants in engine construction.

Remote control installations for Diesel engines appear to be relatively further advanced in the USSR. This also applies to the control platform for a ship's power unit which consists of 2 two-stroke engines each capable of producing 2000 hp and a reducing gear with hydraulic coupling. 25X1

The changing of gears in this installation is done either, mechanically or by using compressed air. The use of electricity is only provided [redacted] for the control instruments.

As a rule during conveyance or transportation, engines are only dismantled as absolutely necessary. The assembly of engines at a place of work in USSR is done at least under the supervision of the manufacturer. Abroad such assembly is done under the supervision of the works' own mechanics. For the assembly of engines and their installation, no methods are used which are not known in the DDR.

5.10 Various technical problems.

The planning of plate and profile material as well as of mass produced parts for shipbuilding.

This is undertaken by the Central Design Bureau [redacted].

The lists that the Central D- B- [redacted] prepares of materials and parts that are to be mass-produced for the particular type of ship are checked in Dept 4 (General Technology and Norms) of the Institute for Technology.

The shipyard receives only those lists of materials and mass-produced articles that have been checked by this Institute and which bear a note showing that the Institute has approved them.

The Institute for Technology works very closely with the Institute for Standardisation. In each case it is guaranteed that the quantities and sizes of the materials contained in the materials lists will be produced by the industry.

The shipyard forwards its material and mass production plan for the coming year to the Ministry - often by 30 Jun of the current year. This plan is approved by the Ministry.

As far as the shipyard is concerned, orders are then placed up to the 30 Sep of the current year.

Situations in the mass production plan which are not clearly laid down according to the stage reached on the project, are coped with: the capacity for this is stated in the mass-production plan.

The plates for rolling are not delivered in a de-scaled condition: de-scaling is carried out in the yard.

Use of high duty electrodes, particularly in the construction of sections.

Special high duty electrodes, which are not known to us in the DDR, are not used.

Preparation of seams, particularly in the construction of sections.

Seam preparation in the construction of sections is carried out by working on the seam with a pneumatic chisel; for seams of large dimensions the joints are planed.

Permission for seams to be welded and the control of the preparation of seams is carried out in accordance with regulations contained in the Sea Register. Welding mistakes are cleared by hammering out and re-welding.

Material for the warm insulation of hot pipes.

In general, asbestos sheets are used. In a few cases use is made of spun glass.

Basis for the regulations of the Sea Register. 25X1

On this point, nothing can be reported.

Methods of Works Process planning for newly accepted processes.

The basic methods of work in construction are laid down by the Institute for Technology.

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The tasks of the Institute for Technology as well as the new working methods which are to be developed are planned and agreed by the scientific and technical advisers of the Institute.

Amongst the scientific and technical advisers of the Institute are to be found the manager of the Central D. B. [redacted] and the Chief engineer of Shipyards. 25X1

In this way it can be guaranteed that from the start all new working methods which are under development are known to the shipyards as well as to the Central [redacted] D-, B-,

It can be recommended that this method also be used in the shipbuilding industry of the GDR.

Enquiries from the Central D- B- [redacted] shewed that in general 4 to 5 months are required for preparatory work on a project and 6 to 8 mths are required for the construction.

Generally speaking, one estimates that for a medium sized ship, 2½ yrs are required from the beginning of the project up to the completion of the prototype ship. The first ship is always valued as a prototype and not produced for a set price but in accordance with expenditure.

All modifications and additional work during the construction of the prototype which may occur through errors in construction, fall upon the cost of the purchaser. This is the opposite to the method used in GDR shipyards where a definite price is agreed for the prototype ship and subsequent additional costs for the construction (and modifications) are treated as failures in planning.

Piecework for specialist work (such as rigging lofts)

In the USSR, work on the rigging lofts is in main paid on a bonus/time system. It should be noted that for this system the USSR uses a different method from the DDR for computing such payment.

For a person paid by the hour there is a special tariff which is divided into seven scales.

Awards of up to 35% of basic salary can be made for piecework.

Special features in the establishment of mass production works for shipbuilding.

In the USSR, different shipyards specialise in the delivery of particular articles, i.e. the BALTIC Shipyard in LENINGRAD has its own department for the production of propellers.

In this department, propellers are produced for all shipyards building ocean-going vessels. Propellers are made of both bronze and steel. The workshop is capable of making castings of up to 60 tons in weight. To date the biggest propeller ever made there weighed 36 tons.

There are 4 smelting furnaces available, each with a smelting capacity of 10 tons. In addition, there is a larger furnace with a capacity of 25 tons.

The workshop has its own metallurgical department.

There are no rejects.

The propellers are cast with a short Sinkhead. Through a process developed in the works itself, the head remains molten up to five hours after casting without any cavities forming.

For the shaping of the propeller, a copying-mill is available which can take propellers of up to 6 m in diameter. Work is done from a model of 1:10.

Nickel-chrome propellers are also produced.

Slotting is done by a machine which is not static but can be moved as required. This machine was developed at the SVERDLOV Works.

In answer to a question it was stated that this propeller works was in a position to carry out orders for export.

Part of the GDR's requirements in this sphere could be ordered from LENINGRAD.

25X1

SECRET

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The BALTIC Shipyard has in addition a special workshop for the finishing of ship's shafting. Here work is done centrally on ships' transmissio 25X1 shafts.

Numerous lathes are available. The largest lathe has a turning length of 27 m and shafts of up to 49 tons in weight can be turned.

The shrinking-on of the bushes is done in a horizontal position. Before being shrunk on the bushes are pre-heated electrically.

The shaft casings and bushes are also produced centrally at the BALTIC Shipyard. Again there [redacted] are no [redacted] rejects.

For the production of bushes a special Centrifugal [redacted]-casting machine has been developed which can make bushes and shaft-casings up to a weight of 8 tons. With the machine bushes from 1 metre in diameter and up to 3.5 m in length can be cast.

It is to be recommended that for propeller manufacture in the DDR, a central workshop should be founded which should copy the equipment and methods used in the BALTIC Shipyard.

Shaft inserts

The same recommendation applies for the production and manufacture of [redacted] and shaft casings.

The making of big forged parts used in building ocean-going vessels is also done at one shipyard.

A special department of the NOSSENKO shipyard in NIKOLAYEV is engaged on the production of large forged parts and cast steel parts. In this dept there are six [redacted] ovens available which produce the necessary iron slabs for the manufacture of forged parts.

open hearth Furnaces

In a special shed for the production of cast steel anchor chains, using a specially developed process, 30 joined chain links can be cast at one time.

In this shipyard there is a further central department for precision casting. In this department, all small cast parts (such as for steering, valve working, boring tools) are cast, using a special process, with a tolerance of up to 3/1000 mm.

A further department in the NOSSENKO Shipyard is engaged in the manufacture of small ironwork fittings. Here small fittings for furniture and equipment are produced centrally.

In a special machine construction department, anchor windlasses are centrally built for use in building ocean-going vessels. It is of interest to note that screws and other parts for the construction are not obtained from the appropriate industry but are made in a workshop of the NOSSENKO Shipyard.

Baltic

Ships' boilers are produced centrally in the BALTIC Shipyard for shipyards in the [redacted] area and in the NOSSENKO Shipyard for shipyards in the BLACK SEA area.

The centralisation of mass production in the works of the shipyard industry can be recommended.

An example of the difficulties in which a concern can find itself is illustrated by the "WERFT DER 61 KOMMUNARDEN". At that shipyard the interior construction of the whale-catchers was at a standstill because the Diesel power units from the G[redacted]DR had not been delivered.

ADMIRALTY Shipyard.

At the ADMIRALTY Shipyard, the following workshops and installations were inspected:

1. Shipbuilding

   (a) For chemical descaling, baths are used containing a 20% hydrochloric acid solution with a 5% KS addition to speed up the process. 4 to 8 plates are laid in one bath. The processing time for normal steel is 90 mins and for steel alloys 2½ hrs. Afterwards, the plates are washed in a 5% soda solution. After washing, the plates are put into a bath containing 90% alcohol and 24% phosphoric ac 25X1 and are then placed in an oil varnish solution containing 25% white alcohol to make them rust proof.

SECRET

Steel chips descaling equipment is also in use. In this equipment the rotating shovels have a life of 170 hrs

25X1

(b) Tracing

For five years visual tracing has been carried out, the proportion of visual tracing being 50%.

The drawing loft floor has been transferred from piecework wages to payment by premium, the highest premium being 32%. Workers on the drawing loft floor are in pay group 8.

(c) Marking

An interesting feature of the Marking Dept is a moving band which assures a regular forward movement of the plates. This department is divided into brigades.

(d) Flame cutting

Mainly automatic burning machines are in use. Of particular note was the flame cutting of armoured steel plates carried out under a temperature of 5000° with the addition of iron powder. This equipment has 3 feed inlets, one for acetylene, one for oxygen and one for iron powder (97% Fe).

(e) Section construction

In section construction, 80% of the welding is carried out by automatic means. Each welding machine is equipped with a suction device for removing flux. A new feature was a piece of suction equipment using an air vacuum with a 100 mm air shaft for removing gases created by welding. In the workshops as well as in the yards, there are small installations capable of de-gassing 16 welding points simultaneously by means of a permanent system of pipes with 2" muzzles.

(f) Auxiliary equipment for tests

We were particularly interested in the new equipment shewn to us, designed to bring about maximum acceleration during tests. This has made tests hitherto proscribed unnecessary. This piece of equipment consists of a two-piece double tube fitted for 40 mm air pressure, with small holes arranged on one side of it. This equipment is provisionally connected to the screw shaft of the ship before it is lowered into the water, so that during the test the stagnant water can be aerated by means of the introduction of oxygen.

BALTIC Shipyard

The BALTIC shipyard originally consisted of two private concerns which were then amalgamated. The yard is 100 years old and after the amalgamation had the following programme:

(a) Civil and Naval shipbuilding;
(b) Shipbuilding;
(c) Machine construction;
(d) Foundry;
(e) Auxiliary machines;
(f) Turbines.

In 1903 and 1904, the first cruisers were built there under the direction of BUGNOV and DREHLOV. These were the "PETRO PAULO" and the "SEVASTOPOL". After the October Revolution, the yard was put at the service of the people and, from 1924 onwards, the following were built:

Refrigerator ships with a capacity of 2700 tons of frozen fish or 3000 tons of salted fish.

Inland tugs and ice-breakers of 770 tons displacement and tractive power of 10.5 tons.

It is planned to begin building large tankers of 25,000 TDW with a speed of 18 knots using 20,000 hp.

25X1

Since 1934, "SULZER" Diesel motors have been built there with 2,400 hp.

Shipbuilding and machine construction in the works are divided up in the following manner:

SECRET

I. SHIPBUILDING

(a) Preparation and cutting (Burning, Pressing);

(b) Building of sections (flat and thick sections, automatic and semi-automatic welding).

25X1

(c) Putting sections together on the slipway;

(d) Equipment of ships (construction of pipes, mechanisation);

(e) Equipment of ships (furniture, deck equipment);

(f) Mechanical Dept, installation of pipes, hand-over;

(g) Electrical equipment. It is to be noted that all electrical equipment and switch panels are produced at the yard.

(h) Woodwork, primarily the laying of decks.

(i) Painting and insulation.

(j) Ropes and cables.

II. MACHINE CONSTRUCTION

(a) Model workshop;
(b) Steel foundry;
(c) Cast steel parts;
(d) Electric arc furnaces and melting furnaces;
(e) Brass foundry;
(f) Forge;
(g) Steam hammers;
(h) Presses;
(i) Manufacture of fittings;
(j) Mechanical workshop; shaft leads; shafts; rods; steam fittings in larger sizes;
(k) Boiler forge; ships boilers for high and normal pressure;
(l) Manufacture of propellers;
(m) Various other auxiliary products.

An inspection of the various parts of the shipyard presented the following picture:

1. Shipbuilding

The descaling of the plates is carried out either chemically or with the use of steel chips.

For tracing work the shipyard has a large loft.

Visual flame-cutting is carried out with projection flame cutters operated photographically 1:10. The controls and necessary prints are kept in a special temperature controlled room. Special containers are so arranged under the cutting table that they collect chippings from the flame cutting machines.

In the shipbuilding shop, automatic or semi-automatic UP welding is in almost exclusive use.

The sanitary installations (showers and washrooms) as well as the dining room visited were exemplary. Workers doing particularly dirty jobs are supplied with protective clothing.

The yard has three slipways, one of which is a large slipway which, at the time of inspection was being used for refrigerator ships and tugs. This slipway is equipped with 3 x 75 ton luffing cranes and 3 x 20-ton rotary tower cranes. The two remaining slipways, which are smaller, are each equipped with one 75 ton and one 45 ton crane.

2. Machine construction

The yard possesses a remarkable workshop for the manufacture of propellers. This shop has its own foundry, capable of turning out cast pieces of up to 60 tons. (The largest propeller made so far had a weight of 36 tons). There are 4 smelting furnaces with a capacity of 10 tons and one furnace with a capacity of 25 tons. 25X1

It was worthy of note that the propeller was cast with a very short riser gate and by means of a special process the head was warmed, using peat so that the head remained molten whil[redacted] the cast was cooling. For work on the propellers, a copy-milling machine is available which makes it possible to handle propellers up to a diameter of 6 m. The propeller finishing machines work from a model of 1:10. In addition to propellers made from mixed metals, ones made from nickel-chrome and steel are also manufactured, using an alloy of up to 14% chrom[redacted]ium. It was said that no special difficulties were being experienced during the production. The grooving of the propeller is done with a collapsible machine.

The production of bushings [redacted] and Casings [redacted] is done on a centrifugal casting machine weighing 8 tons. Bush[redacted]ings from 1 m in diameter with a length of 3.5 m can be made on this machine. The bush[redacted]ings made on this machine are absolutely perfect. The number of finished articles rejected is nil.

In the mechanical workshop for the manufacture of shaft casings, there are large shaft-turning lathes which make it possible to work on shafts weighing up to 49 tons and up to 27 m in turning length.

In addition to the big lathe with a turning length of 27 m, a further lathe with a turning length of 21 m is available. Also worthy of note are the 2 large turning and boring mills and the 4 plate boring machines which are in this workshop.

Bush[redacted]ings made with the centrifugal casting machine are sweated onto the shafts after being pre-heated electrically in the mechanical workshop. This work is done in the horizontal position.

3. Boiler forge

Construction in the Boiler forge is done on a range system. Of note was a multiple-drill boring machine which bored the boiler drum with 8 drills. One innovation came to light - the pipes in a water-tube boiler are not roller expanded in the drum but are electrically or hydraulically pressure forged.

4. Copper Forge

In the copper forge, standing near electrically heated ovens, there are up to 400 pipe-bending machines available. Pre-warming in readiness for bending is done by a high frequency process which enables the pipes to be bent according to patterns without being filled. The consumption of electricity amounts to 0.86 Kw/H for 1 Kg of pipe weight. The frequency alternating current is 2500-8000. The feed motion of the pipe is 1-5 mm/sec. The combined capacity of the installation is 250 kw. Using the installation, pipes with a diameter of up to 515 mm and wall thickness of up to 16 mm can be bent.

Of special interest was a method for producing Crimped [redacted] pipes. Also on this machine the pipes were pre-heated using high frequency and hydraulically pressed at the necessary temperature so that a crimp [redacted] in the pipe was made. Using this method, approx 2½ minutes were needed to make a crimp [redacted] in a pipe of 325 mm diameter with a wall thickness of 9 mm.

The pipe flanges were all semi-automatically welded and for this purpose a piece of revolving equipment with automatic welder is available. For making grooves and threads on copper pipes, an electrical process using contact electrodes is available. In addition, threads are also made on a special draw-bench.

For the production of pipe coils, a special butt-welding machine was demonstrated by which after welding, oxygen is blown through the pipe, thus guaranteeing a clean inside surface.

5. Determination of capacity and planning.

Capacity is determined in relation to working space and the number of work machines. For instance, in the pre-assembly department it is determined by the floor space of the sheds: in the slipway assembly department it is determined by the number of slipways and total of cranes, welding machines etc. For planning purposes, a 14 hr day and 308 day year is taken. This plan is based on working capacities as at 1 Jan of the current planning year and any possible eventual increases in capacities which may occur during the year are not taken into account.

25X1

The perspective covers 5 years with the following known factors for the plan:

The type of ship;
the shipyard;
number of ships to be produced;
number of employees available;
amount of cash invested and
the guarantee of supplies.

Contract dates are never more than 1 year in advance.

Plans for mass production are laid down by the Ministry and 3 mths before the end of a year, orders are placed with the mass production industry for the following year. The shipyards submit their plans in this respect for agreement by 31 Jul for the following year. For projects where the detail of the construction is still not clear, allowances are made in the plan by leaving an approx percentage of the capacity factor free.

The works' plan is discussed by the works' committees and by the production advisers. The ship is divided into constructional sections - e.g. for a refrigerator ship, the number of different sections amount to approx 1000. The work productivity is determined in Roubles without mass production costs (which are included in the sales price as and when they occur, even though at the time the cost is included the actual part has not yet been installed and is still in store).

6. Plan control

The Head of Production is responsible for controlling the plan. This is effected through the dispatcher department. The dispatcher department checks the construction groups daily and in this way the daily impact that the work is making can be assessed. By the 25th of each month the works receives the plan for the coming month and by the 1st of each month the foreman receives the particulars of the plan. The various departments make their return to the director of the works. Finally the works' plan is sanctioned.

Quarterly plans are discussed in the various departments 10 days before the beginning of the quarter. After he has received reports on them, the director then approves them.

Common costs and the cost of power are not charged to the departments. The departments are instructed to allow 3-3.5% for unforseeable work.

Each department receives premiums each month for the fulfilment or overfulfilment of the plan. A premium is paid when the nominated work has been done and when the wages fund is still solvent, i.e. when the fund has not been fully exhausted. Savings in the wages fund are paid out as premiums.

7. Various index figures

In the BALTIC shipyard the following approximate time values apply:

Steel - 80/90 days.

The consumption of steel in the shipbuilding shed amounts to 2.52 t/m^2.

The consumption of steel in the section building shed amounts to 1.43 t/m^2.

The proportion of the cost of the steel in the total cost of the ship is 10%; the proportion of the cost of the mass produced articles in the ship is 35% (for refrigerator ships 57.5%); the proportion of the goods delivered from other concerns 7%; the proportion of goods that are mass produced for other works 17%.

The annual output of a worker amounts to 65,000 roubles, for which he receives a wage of 10,400 roubles.

Production workers constitute 74.5% of the total employees; the engineer, technical and administrative personnel 16.5% and the rest 9%.

The proportion of piece workers amounts to 68%. 25X1

The average norm fulfilment is 170%.

The effective hours worked by a worker in a year amount to 2,033.

Sickness	4.2%
Leave	6.2%
Free time and duty journeys	0.33%
Dawdling	0.05%
Works protection service	1%.

The consumption of energy in section construction is 43 kw/h.

Building time for a refrigerator ship is 14 months, of which 3 months are for preparation, 6 months slipway, 3 months for fitting out and 2 months for testing.

8. Construction records.

All construction records emanate from the Central Construction office. Defective work on the first ship is paid for by the customer; the blue prints are corrected after the completion of the first ship. Any subsequent costs that are caused by bad workmanship must be met by the Construction office.

If a trial ship is not built and if series production begins simultaneously with the construction of the first ship, then the customer has to pay for any costs that are incurred through alterations in construction in the ships that are subsequently built.

9. Organisation and some approximate values

The production management consists of:

1 production manager;
11 planners;
3 duty engineers;
6 production controllers (dispatchers).

It has been estimated that for every 50 production workers there is one technologist; for every 45 workers one controller and for every 24 workers one foreman.

For basic work, the strength of the shipbuilding brigades is 2-12 men.

Technical calculating for economy control deals with the actual costs incurred and the prices of supplies.

Jobs that take 90 days are generally described as long term and are correspondingly financed.

Every month the director holds a meeting to discuss profits. The main business dealt with at this meeting is the profits coming from production, in connection with which secondary production is not dealt with in detail. Book-keeping in the works is centralised; on the other hand, wages accounts are decentralised. Women constitute 95% of the workers in the accountency department.

The market department is 7 men strong.

The firm price is fixed when the ship is 75% finished.

10. Trade Union duties

The structure of the party organisation conforms with that laid down in the statutes; namely, that a basic organisation consists of 15-130 comrades. Larger basic organisations are divided up into various party groups. The administration has its own party group.

Once a month a party meeting is held at which the various points on the agenda are ideological education and economic matters. The committee is constituted once a year through new elections. The party organisation has 3 full time secretaries in the basic organisations.

The larger duties of the works are deliberated in the smallest circles whilst duties of a wider scope are discussed by the works committee. Party groups are introduced in difficult phases in production in order to activa the work.

Competitions are held:

(i) for the fulfilment of the plan with any particular part of the works
(ii) to activate construction of houses.

In addition, many individual engagements are entered into - through which the obligations that have been accepted in the works committee meetings and in the production discussions are closely controlled. Acknowledgement for jobs well doneis put up on the works board of honour.

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In addition, monthly competitions are held between the various departments and 3 flags are provided by the works management for the best workshops. For competitions, the premium is decided on beforehand and made known.

Shipyard of the "61 KOMMUNARDEN" NIKOLAYEV

The shipyard was founded in 1789: at first sailing ships were produced there and later steel ships.

During the war the shipyard was almost completely destroyed but has now been completely rebuilt. The shipyard lies at the junction of the BUG and INGO rivers. Since the rivers have steep banks, the sheds are situated above and the slipway is on a natural slope.

The structure of the shipyard corresponds to that of the other yards. As the shipyard does not possess its own department for engine construction, the main and auxiliary engines are delivered to it. The shipyard works in the usual fashion in one shift whilst only preparatory work is undertaken in the second shift. The third shift is only used for individual matters.

De-rusting and de-scaling

De-rusting and de-scaling is undertaken in the shipyard after cutting has taken place and then by chemical means. The installations are capable of 35 tons per day.

The optical tracing method is used in this shipyard.

The proportion of automatic welding in this yard is only 20%. In the shipbuilding sheds there are cranes with a lifting capacity of 40 and 30 tons, which are used to transport sections.

For the steel scaffolding construction on the slipway, cranes of 30 and 5 tons are available.

The production programme of the shipyard used to include the construction of whale catchers with a displacement of 1200 tons and an engine performance of 4 x 1100 hp. The steel weight of this type of ship is 600 tons. The whale catcher is produced on the average in 13 months. A building time of 10 months was however reached when no difficulties over mass produced materials were encountered.

The norm fulfilment in the yard is 140-150% - the proportion of piecework is 60-65%.

For every 40-50 production workers there is one foreman.

The shipyard keeps a small constructional office for any constructional questions that arise during production.

The dispatchers are under the control of the production chief. In this shipyard there are 1 chief dispatcher and 2 shift dispatchers whose daily duties consist in controlling the production plan; that is to say, the following up of graphs and operational interventions in order to avoid any possibility of future bottlenecks.

Discussions over production matters are held whenever urgently needed but in any case at least once every ten days, for which every section involved in production holds a meeting. Every 10 days the director holds a meeting with the heads of the various sections in order to clear up matters concerning bottlenecks.

The production of the shipyard was 70% on shipbuilding and 30% on agricultural contracts. The order concerning agriculture was given by the ministry - all works were being brought in to help in the creation of a speedy mechanisation of agriculture.

A completely flawless technological sequence of the processes of production as it affects shipbuilding in this shipyard is not guaranteed because of the constricted nature of the yard.

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NOSSENKO Shipyard, NIKOLAYEV

NOSSENKO Shipyard was the largest shipyard visited by the delegation. It was founded 60 years ago and its installations are large enough to cope with the construction of the largest ships - tankers, fishing vessels and factory ships are at present being built there on assembly line methods. During the course of the year it is their intertion to lay the keel of a whaling supply ship with a displacement of 40,000 tons. In addition, the construction of a new series of 16,000 ton freighters is planned for the end of the year.

The following departments are directly under the Works Manager:

Planning department;
Department for work and pay matters;
Quality control;
Investment department;
Delivery department;
Sales manager with finance department;
Bookkeeping department;
Purchasing and mass produced materials;
Storage department;
Commercial department;
Cadre department;
Social services department.

The immediate deputy to the Works Manager is the technical head, who controls:

All production departments;
The heads of the various projects;
Works preparations;
Construction Office;
Technology and new methods;
Main metallurgy departments (castings and forge);
Security;
Head mechanics.

There is in this shipyard no Production Management. Production is the direct responsibility of the technical head. The planning of production is carried out by the Central Planning Dept. The shipyard has 3 divisions:

Shipbuilding;
Engine construction;
Metallurgy.

In addition, the yard owns extensive installations for the production of houses for its employees. In addition to his own activity, the Head Mechanic deals with the building of any additional houses. The yard has among other things its own brickyard and its own furniture makers etc. 1.5 million rbles are made available from the "directors" funds for the building of those additional houses.

Shipbuilding

For the construction of fishing and factory ships, there is a large shipbuilding shop with a floor space of 150 metres square. The shop is divided up so that it can deal with 5 ships at a time and is fitted out with a corresponding number of cranes and machines. The attached photographs give a view of the erection and technological sequences employed in the construction of these fishing and factory ships.

It must also be mentioned that at the top end of the shop there is an assembly hall that is equipped with an assembly track and heavy travelling cranes. Ships are launched by means of a floating dock.

This shipyard was extensively mechanised in all the workshops that dealt with production:as well as a recently built mechanical de-scaling installation, the yard also possesses a chemical de-scaler.

The pipe-fitters shop was well equipped with electrical heating ovens and "cold-bending" machines. Particularly noteworthy was a newly developed universal machine standing in the preparation shop of the shipbuilding

25X1

division. This machine produces ship's sections which rest on spindles previously chosen pressure points - this method guarantees adjustment into the most varied shapes.

Engine construction

In the engine construction division, a hall has been provided for centralised production of anchor winches and 100 ton eccentric presses. A further hall serves for the production of ship's screws. In addition, there is another hall available for the centralised production of tools driven by compressed air.

Metallurgy

The shipyard possesses 6 open hearth furnaces [redacted], a large steel foundry and a cast iron foundry, also a department for precision casting. In these departments small castings with a tolerance of 3/100 are produced. A new method of producing cast steel anchor chains was introduced whereby 30 links up to the largest dimensions can be simultaneously cast, each linked to the other.

In this shipyard, ships' fittings of every kind in cast iron and soft steel are cast, pressed, bonderised, galvanised and coppered and brass armatures of every kind, even electrodes, are produced. These parts that are produced in the shipyard not only cover the yard's own requirements but are delivered to other yards and works.

In addition, the yard possesses a well organised boiler workshop in which boilers are produced for ships of all sizes and for all purposes.

The yard possesses an excellently fitted out technical office. In this office we were shewn amongst other things:

(a) The production of anchor chains in one casting (as described above);
(b) By means of different diagrams we were shewn the development and improvement of production methods that the yard has. In this connection the number of hours for the series production of ships had considerably fallen. For example, for tankers there were the following figures:

	1951	-	100%
	1956	-	56%
For freighters:	1951	-	100%
	1956	-	36%.

The shipyard also possesses a works' library which at present contains 60,000 volumes. Each year, books to the value of about 120,000 Rbls are purchased.

Shipyard KHERSON

This shipyard was newly built in 1949 and construction is to date not yet completed. In 1953, the first shed was completed and the first slipway in 1954. New construction of larger ocean-going vessels could then be undertaken. The shipyard is intended for the construction of large merchant ships and freighters of from 10,000 - 18,000 tons. The building capacity of the shipyard is 12 to 15 ships a year. At the present time, tankers are being built with a length of approx 145 metres beam 22 metres and draught 8.7 metres. The tanker is a single screw ship and is powered by 2 Diesel engines made by the firm of RUSSKI DIESEL, LENINGRAD, with hydraulic clutch and reduction gears. The weight of steel in the ship is approx 4,000 tons.

The shipyard has the following installations:

(a) Equipment store;
(b) Drawing loft;
(c) Drafting department;
(d) Shipbuilding shed;
(e) Slipway;
(f) Pipe fitting workshop;
(g) Fitting out department.

In addition, the yard is equipped with its own oxygen plant, electricity works and boiler house.

As a sideline to the shipbuilding production the yard manufactures harvesting machines and auxiliary engines. 25% of the total yearly output is of non-maritime goods.

The yard is organised as follows:

The shipyard director has the following departments under his direct control:

T, LJ, Q, K, and A.

The technical director controls all Production and Technological departments as well as the main construction office and chief mechanic.

For production purposes all project managers come under the control of the technical director. The construction office is used solely for modification work and small, single drawings. It is also responsible for delivery work.

Division of labour for this works is as follows:

1 controller for every 40-45 production workers;
1 Technologist for every 40 workers;
1 Foreman for every 20-25 workers.

The yearly works plan is issued and approved by the Ministry.

The co-ordination is undertaken within the shipyard. Raw materials are ordered quarterly. The technological office distributes materials and keeps the necessary records.

The technologists' Office issue the plans for the completion of projects. The monthly steel requirement is 2500 tons.

Descaling [redacted] is carried out by a centrifugal machine using steel shot [redacted]

There is a LUMO print machine available in the drawing department. There is also a photo-electrically controlled flame-cutting machine which works to a scale of 1:10.

For the transportation of materials to work areas on certain pre-determined routes, a wagon provided with an electric motor and gears and slide cable feed is provided [redacted] which will be operated by a [redacted] transport worker.

The slipway berths consist of two parallel tracks (each of 3 m) which allow 4 ships to be built at the same time. Two of these berths are fitted with permanent steel scaffolding and each has 3 bridge cranes of 50 ton capacity. Before the ships are launched they are mounted on assembly-line wagons fitted with hydraulic lifting devices, each with a dead weight capacity of 250 tons. Two cranes of 15 ton capacity are available for the second position where interior work and equipping is carried out.

The ships are launched by means of a wet dock to which both slipways lead. The wet dock allows the floating of ships of a length of up to 220 m, but owing to the flood gates a beam of 18 m only can be taken. The flooding of this comparatively large wet dock takes 18 hours.

To a great extent, CO^2 [redacted] welding is used whereby four times the speed of normal electrode welding is achieved and a 50% saving in costs.

An automatic [redacted] Submerged welding plant is also used for upright section joints.

For trials and for equipment of the ships there is only a comparatively short wharf available, with a gantry crane of 15 ton capacity.

RUSSKI-DIESEL, LENINGRAD

The works lie within the city area of LENINGRAD, near the FINLAND station; they are hemmed in on one side by water and on the other by extensive blocks of buildings. There is no room for expansion.

The works, which formerly belonged to the Swedish industrialist NOBEL, have been closely linked with the history of the Diesel engine since its inception. The Diesel engine originated considerably more than a hundred years ago, its fame reaching far beyond the frontiers of the RUSSIA of those days. The situation today, however, gives little cause for satisfaction. Owing to the small area to which they are confined, the works have had little scope for development; the sheds and the engine depot are relatively old and the need for a central warehouse is particularly in evidence. There is considerable interference with production through the storing of completed and semi-manufactured components in the sheds themselves. As far as machine tools are concerned, it is mainly a question of universal machines. Contrivances and special tools are employed to a small degree only.

25X1

Two types of two-stroke engines with medium-sized swept volume of the trunk piston construction and cross scavenging, are manufactured. It is here a question of relatively heavy type engines which, although they have proved themselves under the special circumstances prevailing in the Soviet Union where they are generally praised, can hardly be compared to the present standard of world development. The castings, for the greater part very 'strongly walled', are 80/85% produced in the works' own foundry, the remainder being furnished through the mass production industry.

There is no forge at the works. Special components, and in these is included the completely manufactured crankshaft - are drawn from outside factories. There is, on the other hand, a small section of the works - with a preponderance of female labour - where injector pumps and injection nozzles are manufactured.

The production of the two types of engines is carried out in separate sections of the works. Mechanical work, assembling, testing, preparation for despatch, the inside and external preservation takes place in one shed, although in separate shifts.

In the case of the smaller type D30/50 it is a question of a [redacted] Simple two-stroke engine with cylinder diameter 300 mm, a piston-stroke of 500 mm with 300 revs/min and 100 hp cylinder performance. The engines are fitted with 4, 6 and 8 cylinders, with an without reversing gear, for use as generators and as main engines for ship propulsion. The plane piston of the engine with normal piston pin finish is made of alloyed cast iron and is uncooled; the combustion chamber is in the concave hollowed-out cylinder head. Fuel is injected direct into the combustion chamber by a fuel injector pump with relief valve, operated by the camshaft which runs through the crank chamber. The ignition pressure amounts to about 60-62 kg/cm^2 by full load. The engine is started by air pressure through the medium of pneumatic operated starting valves in the cylinder head. The motivation of the starting valve is by means of a rotating starting-air distributor, driven by the camshaft over bevel gears. The cams (Nocken) for the injector pump are symmetrically formed. On the reversing of the ships' engines, the camshaft is not moved (although presumably turned!) In the case of ships' engines, the number of revolutions is regulated by a cutout governor. The scavenging is carried out by a scavenging pump with two pistons in tandem, fixed to the free end of the shaft and the starting compressor is operated by the lengthened piston road of the scavenging pump.

The exposed base plate of the engine can be covered by a metal container which can at any time be adapted to the position of the engine. The base plate and cylinder block are single-wall centrifugally cast cylinder liners with milled slits. The upper part of the block is provided with a forced water lead (with casing!) in order to facilitate heat dispersal by increasing water velocity.

A conservative estimate of the service condition of the engine is:

Piston speed	5.0 m/sec and
Intermediate pressure	4.25 kg/cm^2.

Fuel consumption of maximum 185 g/hp (corresponding to 176 g/HPe + 5%) is guaranteed. Consumption of engine oil is 5 g/HP/h. The figures can in each case be regarded as ample. The same applies to the weight which is given as 25.5 t for an 8-cylinder engine, without taking the flywheel and incidental parts into account. Attempts to increase the power of the engine by 25% are taking place in a special testing hangar.

12-14 engines type D30/50 with on average 6 cylinders, are produced each month in LENINGRAD. Five test benches are available for testing of these engines. There is no evidence that the same types of Diesel are also being manufactured at any other works in the Soviet Union.

In the case of the larger engine, DR 43/61, only the 8-cylinder type for operating merchant shipping is being produced, the technical data of which is:

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Diameter of cylinder	430 mm
Piston stroke	610 mm
Power	2000 hp
Number of revolutions	250 revs/min
Piston speed	5.1 m/sec
Intermediate pressure	5.1 kg/cm^2
Weight (without flywheel etc)	62 tons.

The type of engine is similar to that of the smaller engine D30/50, although the cylinder block is highly placed, i.e. sub-divided in a crank case and base plate. The crankshaft is in two parts with a flange in the middle and on either side of the flange a base plate bearing. The camshaft for operating the injector pumps and the starting distributing valves is situated outside the crank chamber in a recess between crankcase and scavenger-air receiver. Two injector pumps are joined to each block. The air distributing valve is the same.

It is worthy of note that in the case of engine 8 DR 43/61, little trouble was taken to maintain uniformity of style in the single cylinder sections and the structural components (e.g. by symmetrical forming). The reason for this may be that these engine types were from their inception not developed as a series type.

In the case of motor 8 DR 43/61, the scavenge air is dispersed by induced draught fan operated from the free axle end of the engine. Owing to the flange mounting of the draught fan in the axle extension of the engine, there is a considerable increase in the overall length. The draught fan is operated by means of an elastic (resilient) clutch (with spiral springs) and a firm clutch (Festkupplung) to cancel out any assembly discrepancies. Additional to the elastic clutch for draught fan operating, the free flange of the crankshaft carries an oscillation damper with laminated springs (alike or similar to the MAN-Renk type). By virtue of the existing arrangement of the draught fan it is impossible to equip the engine with lubricating or water pumps.

The shape of the combustion chamber [redacted] is very much like that of the "Hesselmann [redacted] engine between [redacted] the piston head and [redacted] the slightly arched cylinder bottom. The piston is multi-sectional and is cooled by means of oil supplied through fixed telescopic cooling pipes. Compressed air accumulators are provided for pressure stabilisation in oil cooling. The piston design, or the formation of the piston pin bearing, is similar to that of the GZ "MAN" engines, excepting that the piston pin with increased bearing surface works here in its own piston liner. There is no breaking through the cylindrical convex surface of the base of the piston as the piston liner is introduced and screwed on from below. This is an advantage as far as oil density and the avoidance of carbon pockets is concerned but the advantage is obtained at the expense of greater strain in the bearings. In the case of a test engine, at the disposal of the chief designer for further development, the unusual piston-pin design has been abandoned. Here the piston-pin bearing was inserted at the sides and the openings closed by caps. To guide the pistons, lead-bronze guide rings (manufactured according to the "centrifugal[redacted] casting[redacted]" method) directly under the upper part of the piston, were in this case employed. Together with the changed piston form, new types of cylinder liners, cylinder heads, draught fan operation and injector blast jets were at the time of the visit being subject to endurance tests in the chief designer's testing plant.

Fuel consumption of maximum 180 g/HP/h (corresponding to 171.5 g/HP/h + 5% is guaranteed in the case of the engine 8 DR 43/61. This rate of consumption is not exactly favourable for a two-stroke engine of 2000 HP and lubricating oil consumption is, in addition, to be reckoned at 5 g/HP/h, which is very high.

The intermediate pressure of the engine - 5.1 Kg/cm^2 at full power - can be regarded as exceptionally good. An attempt is now being made to increase the relatively favourable rate by 50% by means of turbo-blower-charging. A test machine (only 4 cylinders operating) has already been running in the testing hangar for 40-50 hrs with an appropriate load. It is here a question of a normal type engine with alteration in the compression only. The supercharging unit, which is connected up with the mechanically-driven draught fan of the engine is "boosted" with exhaust gas by means of two exhaust pipes (for the 4-cylinder engine).

Whilst passing through the Shops [redacted] where engines D 30/50 were being produced, an opportunity was afforded to gain an insight into all details of the engine and its manufacture. The standard of workmanship (surfaces, adherence to measurements etc) can, generally speaking, be described as good, whereas actual run of production in the hangars is less satisfactory.

Machine tools are grouped together according to type without regard to their technological aspect. This might be excused by the fact that there are relatively few components to be manufactured.

The crankshaft of the engine is not bedded in the baseplate bearing. The grade of the bearing is merely checked by means of a smooth shaft-gauge before the fitting of the crankshaft. The finishing of the cylinder liners, from a centrifugal casting, before honing - is accomplished by turning tools fitted with Keramic plates. In spite of the cutting being interrupted by the scavenge and exhaust ports, the stability of the lip is said to be fully satisfactory. The surface quality obtained can be described as very good.

Before the engine is assembled, the components are painted thoroughly, the final coat being applied after the "completion for despatch" section has taken over, when the interior of the engine is also fully protected against corrosion.

Aeroplane engine oil with 5% kerosine added is used for the inside of the cylinder, the solution being applied hot, after which the crankshaft of the engine is given one turn.

The engines 8 DR 54/61 are produced in one large shed. The mechanical side to production takes place in three ships lying lengthwise and is subdivided according to the size of the components on which work is to be done. The assembling and testing of the engines follows in a ship lying athwart the front of the ships lying lengthwise.

A special place near the testing shop proper (fitted with 5 brakestands) has been provided for the assembling of the engines. The completed engines are transported to the testing centre, without the scavenge blower attachment. The plan for trials and taking over is as follows:

30-35 hrs running-in, from idle motion (ticking over) to overstrain;
8 hrs running for inspection by Works Quality Control;
14 hrs running for the USSR Sea Register and thereafter
8 hrs checking run.

The engine type 8 DR 43/61 is at present the largest Diesel engine produced for ship propulsion in the Soviet Union. It is used in almost all the bigger motor vessels now being constructed, unless for any reason Diesel electric drive is preferred.

In the case of Diesel electric vessels, the generators driven by faster running engines are preferred as, for example, at the BALTIC Shipyard in LENINGRAD, where three engines, each of 1860 hp at approx 600 revs/min are installed in refrigerator ships: it is here a question of ten cylinder two-stroke opposed-piston engines with two crankshafts, developed in CHARKOV with a capacity of 2000 hp for locomotive propulsion.

In Memory of the Communards

Whaling vessels of the "[redacted] 61 [redacted]" Shipyard at NIKOLAYEV are fitted with four Diesel generators, each of 1100 hp. It is here a question of fully closed-in types of 4-stroke engines, likewise emanating from CHARKOV. The number of revolutions of the engine could approximate 375 revs/min. The engine and generator are, moreover, now flanged together as one block. The turbo loading blower is situated on the generator and the compressor intercooler allows for closing by a higher rate of supercharging. The engines are strongly built.

For the propulsion of larger vessels - approx up to 10,000 tons - two engines type 8 DR 43/61, with a reduction gear, are usually combined as one unit, with the engines and reduction gear linked up by means of two fluid couplings. A capacity of 3800 hp by about 85 revs/min is available at the gear exit flange. The 10,000 ton tankers of the Admiralty Shipyard in LENINGRAD and the KHERSON Shipyard are fitted with this type of installation.

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For the operating and supervision of the units, central control platforms with all essential instruments have been developed for erection in the engine room. The control centre is connected mechanically with the engines (or gears) for the adjustment of the number of revolutions, electrically connected for the control instruments and pneumatically connected for the necessary clutch throwing. Operating errors are to a large extent eliminated by an interlocking arrangement with the engine-order telegraph and the check machines for engines and screwshaft.

Double installations of the type just described are delivered by the RUSSKI-DIESEL works, complete with the requisite electrically driven pumps. coolers etc; they also construct the gearboxes. The toothed wheels and couplings for the gears are mass produced. The gearbox casing is cast and processed at their own works. The erection of the gears is followed by a short test with electric drive and without undue strain, at a low rate of revolutions. There is, as a rule, no testing of the engines and the main engines as experience of such testing has hitherto produced no noteworthy results, although allowance must be made on board for a special running-in operation of the gearing. It is only at the specific request of the buyer that a complete test of the power unit, inclusive of gearing, is made at the works. At the time of the visit, such a test was being made in connection with a Government order.

The reducing gears are provided with a single plate thrust bearing for an admissible load of 60 tons, to take the propeller thrust of the outward shaft. Four smaller single plate thrust bearings take the axial force of the driving shaft and secondary shafts, caused by the helical (spiral) gearing and the pressures in the hydraulic coupling. The runner of the hydraulic clutch is fully welded. A slightly alloyed steel is used for the entry pinions of the gears, the large cogwheel consisting of carbon steel of the type "St 45". The flank pressure of the cogwheels is slight, presumably because the intended power increase of 50% has already been taken into account. The first gears showed no deposits or pitting whatever after a running period of 15.5 hrs with full power. At the present time, some 16-18 engines type 8 DR 43/61 are being produced annually in LENINGRAD. The same type of engine, including gears, is also being constructed for the Soviet Union at the WILHELM PIECK works (formerly SKODA) in PREG-SMYCHOV, in accordance with production data provided. Here the capacity approximates 12 engines and 6 gears per year.

Additional to visiting the main sheds where the two types of engine were under construction, a short visit was paid to the materials testing laboratory, the foundry and the injector workshops.

The cast-iron foundry is relatively well-equipped in comparison with the rest of the works sections. There is, for instance, a wet cleaning plant, cupola furnaces which function with oxygen supplement; special cast-iron for components subjected to particular stress is smelted in a large arc-furnace and transportation bands with slings are available for conveying the moulding sand for filling the moulding boxes. The trough drop forgings for the cylinder bushes are produced by the centrifugally cast piece process, a centrifugal machine with 450 revs/min being available. The ingot moulds, contrary to the procedure customary at BLANKENBERG, are lined. Each lining stands only one casting and must therefore be freshly stamped each time. The hardening of the casting is done by the WASSERGLAS CO_2 (sic) process. For the production of sphaerolitic cast iron there is in addition to the cupola furnaces, a metal chamber with a filter appliance for screening against light during the injection of the molten metal with magnesium and to draw off the harmful fumes which are caused during the process.

The chief metallurgists named a scrap quota of about 8-10% average for the foundry and 10-13% for the centrifugal foundry for cylinder liners. The relatively small mixed metal foundry works with high frequency furnaces with up to 150 kg filling and centrifugal equipment. The apportionment for centrifugally cast pieces amounts to about 75%. A crankshaft of the engine 8 DR 30/50 of sphaerolitic cast iron awakened particular interest. In its dimensions, the shaft conforms completely to those of normal type steel, excepting that the shape of the crankshaft web is adapted to the needs - or the potentialities - of the casting. This does not affect the interchangeability. The shaft is cast at the works foundry, whereas the finishing operation takes place at the works normally supplying shafts.

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The shaft is intended for installing in the propulsion unit of a sea-going tug with direct screw drive. The Sea Register of the Soviet Union has for the first time given permission to instal two engines with cast iron crankshafts, in a single ship, following experiments extending over two years at an electricity works on a similarly fitted engine. The results are, in this case, said to be better than those achieved with a steel shaft. Details and experiences in connection with cast-iron crankshafts are to be made available to EAST GERMANY within the framework of the TWZ, following a decision on a vote taken at Länder level in PRAGUE.

The materials testing laboratory is small and equipped only for physical testings. The main function of the laboratory is the testing of the finished crankshafts. Each shaft is examined by Röntgen X-raying or by means of radioactive isotopes. The scant attention paid to protection against harmful rays is astonishing. A ventilation appliance is available (magnetic and electric) but appears to be little used.

The workshops for the construction and testing of injector appliances are equipped with relatively simple appliances for precision work and testing, the majority of which would appear to have been made at the works. They nevertheless produced satisfactory results by virtue of the good workmanship in their manufacture. The cleanliness and tidiness in rooms where work was being carried out was exemplary.

During the inspection of the workshops and in the ensuing discussions with the works Director, various questions were dealt with.

Indirect cooling is also employed at the RUSSKI-DIESEL works - as and when required - for both types of engines under construction. The requisite pumps are then, in the case of type D 30/50, attached to the engine itself. The heat exchanger is installed separately.

As far as power transmission to the propeller is concerned, Soviet specialists share the views at present held in GERMANY, i.e. that indirect transmission by means of gears or electricity is advantageous for vessels without machinery casing, i.e. in ships where profitable use can be made of the space. Ships where a casing is portable are fitted to advantage with main engines directly coupled with the screw. In the meantime, there are slow running main motors in the Soviet Union but these are only in process of development. A testing stand is under construction at a large-scale works in the Soviet Union.

The RUSSKI-DIESEL Works is at pains to keep deliveries of engine plant as low as possible. Screws, shafts etc do not accompany deliveries. Air bottles, ready for installing, are drawn from outside sources. Spare parts are delivered together with the engine, in accordance with the provisions of the Sea Register and subsequently as ordered for overhauling.

The erection of engine plant takes place under supervision, in the Soviet Union, of the works' fitters. Erection work abroad is always carried out by a works' own fitters.

Diesel generators, for use as auxiliary units in ships' or in stationary installations, are always delivered without a base (according to particulars supplied by the works director). This does not, however, seem to be quite true as the base of a unit on which work was being done was to be seen in the shed turning out engines D 30/50. The workmanship was, however, relatively primitive with little evidence of any considerable experience.

The works maintains its own designing office. There is no centralised designing office for Diesel engines in the Soviet Union. The Diesel Institute in LENINGRAD carries out, in the main, only research work. The designing office formerly available at the Institute was closed some six months ago, odds and ends only being now available. The remaining works constructing Diesel engines in the Soviet Union also have their own designing offices and, in some instances, their own research centres.

The works co-operate on a number of points with the Diesel Institute in LENINGRAD, the BAUMANN Institute in MOSCOW and with the Technological Institute etc.

In the case of research and development work (not continuityof development as stimulated by the works itself) the theme directive is given by the Ministry

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who also work on same in conjunction with the Institutes of MOSCOW and LENINGRAD, the Academy of Science and with specialist laboratories etc. Necessary experiments are carried out at the works or at the Institutes, with the Government attending to the financial side.

There is no basis for research at the works, where all experimental components must be machined together with running production. The resultant clashing causes unavoidable inconvenience and interruption. 25X1

It is the hope of the works director that in view of the impossibility of expansion, the organisation will later operate as a special undertaking for the construction of test pieces and for research work. The installation could not then be maintained at its present size. Developement into a purely assembly and erection undertaking has also been foreseen.

A reduction in the power to weight ratio of the relatively heavily constructed engines D 30/50 and 8 DR 43/61 by a reduction in the type of construction or by increasing the mean piston speed is - because allegedly unnecessary - not contemplated or not considered practicable, without diminishing the service life of the engine and affecting its operational safety. Contrary to these views of the Director, there are however efforts being made to increase considerably the power of the engine by permitting higher intermediate pressures with or without the employment of turbo-charging.

Design

Central [redacted] Bureau for Standardisation

The central Construction Bureau for Standardisation was founded in 1939. Its structure is shewn on the attached plan. From this plan it can be seen that the Bureau consists of the following departments:

(a) Department for Motors (electric).

Standardisation of ships' equipment is carried out here. Standardisation of other electrical apparatus is, naturally, carried out by the electrical industry.

(b) Department for ships' fittings and equipment.

(c) Department for Production

This department deals with general ships' norms. This department also co-ordinates the work of the entire bureau.

(d) Department for specialised production

In this department the lists for the individual concerns are drawn up, on the basis of the Central Construction Bureau's order lists. The nomenclature in the lists is first checked. Parts ordered, which are not normed, can only be produced after special permission has been obtained.

(e) Department for Standards and Drawing

This is the central department for procuring procuring literature for the factories.

(f) Experimental workshop

In this workshop experiments are carried out with test materials.

(g) Technological department

This department is in charge of checking technical details in drawings. GOST norms are used for fittings and tolerances in all branches of industry. There are, in addition, special standards for the ship building industry. Locally adopted standards have to be registered and approved.

In this Bureau, all deck machines are projected and constructed, including electrical equipment. Manufacture and testing is done in factories specially designed for this purpose. Representatives of the Bureau are, however, present during the manufacture and testing of deck machines.

Apart from the above-mentioned departments there are also:

(h) Department for Electrical Engineering

Here all items of equipment and auxiliary motors, except for the main electric motors, are projected and constructed.

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(i) Heat Exchanger Department

As in the case of the deck machines mentioned above, the Bureau also deals with the projection and construction of auxiliary generators needed for producing steam.

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The building and testing of these machines is, naturally, carried out elsewhere, under the supervision of members of the Bureau.

Experimental work is financed by the State. All standardising and norm work is carried out on the basis of contracts. The mandator (either the Central Construction Bureau or the Ministry) divides the cost up among the various projects.

Perspective and quarterly plans are worked out by the Bureau and have to be approved by the Ministry. It can happen that the Yearly Plan is altered during the course of the year.

Projecting and construction work to be carried out is based on similar tasks already completed, for the purposes of planning. Each task is bound by a contract.

Generally speaking, the Bureau does not pay its staff piece-work wages but good work is rewarded by the payment of bonuses. It can happen that draughtsmen, who are often engaged on the same type of job, are paid piece-work rates. Bonuses can be paid up to 1.5 times the monthly wages.

With regard to the use of direct or alternating current on ships, there is no clear policy. It is, however, hoped in future to equip ships with 3-phase alternating current.

It has been laid down that the sheet metal used for the hulls of ships should be Cl-1118-55 and for the other parts of ships Cl-1750-55. Measurements are determined by GOST norms. For example, for ships' plates 10 mm thick there are 11 different lengths from 4200 to 7000 mm and 10 different breadths from 1400 to 2000 mm. It is possible to obtain from the steel mills specially cut plates at a higher price.

Hydraulic steering engines of 10, 20, 30, 45, 75 and 90 M/T have been developed by the Bureau for mass production. Some of those have already been produced. These engines are controlled from the bridge, either electrically or hydraulically. They work at a hydraulic pressure of 135 kg per cm^2. They are powered by a sector unit and possess two pumps

Institute for Technology.

The Institute was founded in May 1948 and is concerned mainly with the development of technology in ship construction. The Institute has five main departments, as follows:

(a) The working out of methods of welding in shipbuilding;

(b) the assembling of ships;

(c) matters of organisation;

(d) the technology of non-metallic materials;

(e) mechanisation in ship construction.

These five main departments are allied to corresponding laboratories in the Institute for Technology, the following research work being conducted in the separate laboratories:

With (a) Shipbuilding-welding laboratory and research into anti-corrosion methods;

(b) mechanical assembly, pipeline construction, electrical fitting-out and ships' trials;

(c) work organisation, general technology, norms in general, working norms, interchange of knowledge and other matters;

(d) laboratory for dyes, moulded plastic compounds and wood, heat and sound insulation materials;

(e) special shipyard installations, compressed air and electrical tools, universal installations, oxy-acetylene cutting, etc.

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Each main department and corresponding laboratory has a plan and its own treatment of themes. The plan is directed to the Institute by the Ministry for the Shipbuilding Industry, whereas suggestions in connection with work on the plan emanate from the undertakings and the ZKBs. All co-workers of the Institute maintain close contact and a lively exchange of views with the undertakings and the ZKBs.

The Institute has two technical advisers, the first dealing with questions that arise in the fields of metallurgy and welding technique and the second with general matters in connection with shipbuilding. Specialists from the undertakings and the ZKBs are taken into consultation at meetings of the technical advisers. These advisers also function in the preparation of plans whereby, of course, accounts of proof of good management are at the same time prepared. The plan finally worked out is confirmed by the Ministry.

During the inspection of the Institute and the corresponding laboratories, the following noteworthy details were established:

There was a demonstration of the building of ships' sections, the weight of the single sections varying between 50 and 90 tons. In the case of new building, two different methods are employed - the "island" method or the "pyramid" method (see illustrations attached).

In adjusting the line shaft bearing, dynamometers are fitted to the bearing in the line-shafting to regulate the strain of the plummer blocks, and the adjustments are made in accordance with stresses registered on the testing stand. The strain on the bearing at any given time is shown on an indicator fitted to the top of the dynamo. The indication accuracy of the dynamometer is about 1%. These dynamometers are produced in six sizes (for further details see enclosure).

Various methods of joining cable ends were then demonstrated on blackboards and similarly, the employment of a deck covering of cement and caoutchouc. According to statements by the Institute, stainless steel is used in propeller manufacture. Current experience shows that propellers made of stainless steel have a service life of ten years whereas according to particulars furnished by the Institute, the life of a "C" steel propeller approximates two years.

The employment of various anti-corrosion materials was demonstrated on other blackboards. The sheets are first descaled by the steel pyrites process or by dipping in muriatic (hydrochloric) acid, after which they are painted with either a solution of phosphate or with varnish in white spirit. This protection prevents corrosion and lasts until graving. New varnishes are being tried out, e.g. "Immulsions" paint, which is dissolved in water and can be sprayed on, in enclosed areas. As a substitute for red lead (minium), a new paint (composition) produced from plastics (synthetic products) has been discovered which, according to the Institute, is 2½ times more durable than red lead and remains appliable up to a temperature of minus 25° (-25°).

Suitable coatings have also been developed for boiler and drinking water compartments. A special coating for tankers is in course of development and is said to be seawater and oil resisting.

In the field of heat insulation, it is stated that the following are used: cork, "Vinidur", ligneous asbestos, glass fibre in mats, glass fibre soaked in venol, sheets of old wool with 15% wood fibre and insect powder, "Perkulit" (a kind of mica with asbestos fibre and a binding agent or agglutinant) and skimmed Venol-resin (very little affected by temperature).

According to statements by the Institute, there is nothing favourable to report on "Piatherm". "Alfol" is only used on vertical surfaces in order that dirty water which accumulates can at once be run off. "Luffa", pressed and soaked in PVC, is also employed. The above-mentioned mica is regarded as the most promising for insulation of rooms.

It was further emphasised that glass fibre has everywhere been turned down but is now returning to favour following improvements which have been made.

In the laboratory for the development of welding research equipment, a magnetic defectoscope, developed in the laboratory, was demonstrated. This apparatus, which functions on magnetic principles and flashes a lamp or rings a bell when this flow is interrupted, is to be introduced for 100% testing

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of welded seams. It is considered that the apparatus will produce a marking when passing over faulty welding. The section in question would then have to be X-rayed. It can be used on plates of 4 to 30 mm in thickness and passes over the welded seams at a rate of between 2 and 5 metres/minute.

A supersonic apparatus, for probing into faults in plates of up to 50 mm in thickness, is in course of development.

The laboratory for contact spot-welding and contact butt-welding, was equipped with first class machinery. Butt-welding of tubing for ventilation ducts was demonstrated on steel and aluminium sheets. The use of compressed air was required in the case of spot welding.

In the meantime, according to information given by the Institute for Shipbuilding, 30% of ventilation ducts are manufactured steel and 70% from metal, of which 60% are shaped and 40% straight.

In the varnishes laboratory, the most varied research work is being carried out on paints which are proof against sea-fouling. The testing of such coatings for use in differing waters and sea areas is, because of existing variations, receiving particular attention. The results of divers experiments on steel plates, moulded plastic compound, metals, porcelain, pottery and several kinds of wood, were shown.

Anti-fouling paints developed at the Institute contain no quicksilver and shewed adequate protection against fouling in varying waters.

New paints requiring no solvent and suitable for sections below the waterline and inner areas, are being developed. According to the Institute, tests carried out on paints developed at TELTOW (EAST GERMANY), have proved unsatisfactory.

In one of the laboratories we were given a demonstration of sediment bath welding (Schlackebadschweissung), whereby two 250 mm thick plates were welded together, flat steel pieces of similar material being used as welding wire. The type of flux depends upon the material.

Central Planning [redacted] and Design [redacted] Bureau, LENINGRAD.

The Central Planning [redacted] and Design [redacted] Bureau was founded about 30 years ago and has always been concerned with the Planning [redacted] and design [redacted] of big ships. To date, about 100 such projects have been realised. Examples are:

(a) large wood carrying cargo vessel, 6200 tdw;

(b) motor vessels for the BALTIC and BLACK SEA, 7500 tdw;

(c) large freight and passenger ship for the POLAR SEA;

(d) ships for the Hydrographic Service;

(e) ships for the ARCTIC;

(f) the Ice Breaker "J.W. STALIN";

(g) passenger vessel for the UKRAINE;

(h) sea-going tugs.

Since the War, the following new projects have been realised:

(a) 10,000 ton tanker;

(b) Diesel cargo ship for dry cargo;

(c) steamship with cargo capacity of 10,000 tons;

(d) refrigerator ship;

(e) deep-freeze ship;

(f) 10,000 ton tanker;

(g) passenger ship for 250 persons.

As the scope of the projects and experimental work grow larger, specialisation was introduced and, amongst other things, an Institute for Standardising was founded. In this Bureau, as will be shewn later, mainly the projection and construction of ships' equipment is carried out.

In the course of the years, a great deal of experience has been gathered in the field of projection and construction, so that ready-made projections and constructions can be given to the shipyards.

Liaison with the experimental stations, institutes, the [redacted] research centre and the shipyards is very close and good co-operation ensures the highest standard of work. towing 25X1

Design

The structure of the Central [redacted] Bureau is shewn on the attached plan, from which it can be seen that the Bureau carries out projecting and construction, i.e. the Bureau also prepares the blueprint.

There are no construction bureaux in the shipyards but only small construction departments whose job it is to deal with internal problems in the yards.

The Central Construction Bureau appoints job constructors for the various ships. After the blue prints have been received at the yard, a group of constructors, including the job constructor, is appointed to follow up the building work and make any necessary alterations. The job constructor is the senior member of this group, appointed by the Central Construction Bureau, and he is responsible for seeing that the ships are built according to the blueprints.

Such groups consist of between 5 and 10 members, according to the size of the project. Any alterations which may be made to the blueprint plan are paid for in the following manner:

(a) in cases where the alteration is caused by a fault in the construction or when bad workmanship can be proved, the cost is borne by the constructor or group;

(b) in other cases by the Central Construction Bureau;

(c) should the customer ask for alterations to be made to the approved project, he then carries the costs. This also applies when the alteration is an improvement on the original construction.

Before work on an order starts, the scientific and other problems involved in the building of the projected ship are discussed and inspected by the various institutes. It is only then that the various stages of work are decided upon and agreed by the customer. The order is then passed by the Ministry to the Central Construction Bureau for the projection and designing. Before final rubber-stamping of the project, a further inspection of various stages is however made.

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As the shipyard which is to do the building is often known beforehand for the certain projects, arrangements can be made for construction to be carried out bearing in mind the type of technological equipment available at the shipyard.

For straightforward orders it can be said that 2 years are necessary to complete the building of a 10,000 ton tanker prototype ship. This period is reckoned from the very start of the projection and includes 4-5 months for the technical project and 6-8 months for the designing.

All ordering of material for the prototype ship is only undertaken by the shipyard after the project has been agreed by the Ministry. Basically, the technical project is produced without any specifications for materials. These specifications are only undertaken by the Central Construction Bureau after the agreement has been obtained from the Ministry. These specifications are used by the shipyard when ordering the necessary materials.

The above method of projection and designing was decided upon after bad experiences had occurred using the former method of work. Formerly the following sequence was used:

(a) The Mercantile Marine fleet passed an appropriate order to the Central Construction Bureau.

Design Bureau

(b) The project was then examined by the Central [redacted].

(c) From this examination there followed the forming of a basic plan for the project, the choice of engines etc.

(d) Work on the order then started.

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(e) Initial plans, followed by the technical plans, were then formed by close co-operation between the customer and the Central Construction Office. The technical plans became the basis for the contract for the building of the ship.

(f) Construction was then carried out on the basis of the agreed technical plan.

This sequence of working was very time-wasting. Nowadays no initial plan is made but, as stated above, work commences immediately upon the technical plan after thorough examination of all scientific and other problems. By the new method it is possible to prepare complete plans for a project in 6-9 months. Through those new measures, the Central Construction Bureau carries the complete responsibility for the making of plans for the whole shipbuilding industry.

During projection, the all-embracing norm standards operating in the USSR are used as follows:

(a) GOST standards which are binding for the whole industry.

(b) The material standards norms for shipbuilding.

(c) The norm for cooling of pipes for shipbuilding.

(d) Norms for the Central Construction Office such as "establishment of types of insulation" etc.

The corresponding literature on the above-named norms is easily obtainable as is that for internal works norms. In addition, the following regulations are taken into account when projecting:

(a) Regulations of the Sea Register. Blueprints are made under the control of a Sea Register inspector and are passed by him.

(b) Special regulations for sanitary arrangements and use of water.

(c) Regulations for fire protection and equipment.

(d) Regulations of the LONDON Convention, 1953.

(e) Regulations for the handling of bilge,

(f) Trade Union requirements.

(g) Regulations of the Ministry of the Mercantile Fleet or Pool.

(h) Regulations concerning the taking-on of provisions at sea.

(i) Harbour regulations.

(j) Regulations for loading/quay installations. Here it must be mentioned for instance that in the waters of the FAR EAST, ships must be moored to the quay at the stern, which accounts for the fitting of reinforced mooring facilities in the stern.

(k) Technical delivery instructions and determination of rules for supervision of engine installations.

Because of the number of regulations which must be followed, freedom in projection is strictly limited.

Technologically, all projects are agreed taking into account the characteristics of the shipyard involved.

For the construction of the ship's body, 2 types of steel are used.

(a) Carbon steel (special attention must be paid during welding against possible loss of carbon content and change in impact value. Carbon steel is little used as thick plating.)

(b) Alloyed steel: by using this type of steel it is possible to lower the weight of the ship.

For ship's frame profiles, unsymmetrical ridge steel is mainly used. For instance, the superstructure is made of alloyed steel.

For insulation the following is used:

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Basically, the technology is worked in with the technical plan whereby the number of ships to be built is taken into consideration. The technology followed by the Central Construction Office Office is divided as follows:

(a) The division of the ship into single sections, combined sections and portions.

(b) Completion date plan with graph of progress.

(c) Scheme for a methodical production.

(d) Welding methods.

(e) Special technological processes.

(f) Computation of the costs of the ship.

One gained the impression that even if the projection and designing took place in construction offices in the shipyards themselves, it would still be necessary to have a central office to deal with perspective projection. In this manner, shipbuilding as a whole would be kept on clear lines.

In addition to the Central Construction Office seen by the delegation in LENINGRAD, other central construction offices exist in the Soviet Union for shipbuilding as follows:

(a) For freight and passenger ships in LENINGRAD and NIKOLAYEV.

(b) For fishing vessels.

(c) For ships for inland waterways.

(d) For technical ships.

The sphere of technical projects corresponds approximately to that existing in our own offices in the DDR.

An important point is that during constructional planning, the parts lists are produced separately from the blueprints. This is to be recommended in case numerous copies of the same lists are required for the technological processing.

One copy of all the documents appertaining to a ship is handed over on delivery. (With completely new type ships, 2 copies of given.)

For costing purposes, the price for projection is estimated at 1 to 1.5% of the total ship's price and the construction planning at 5 to 6%.

The control of constructional time is attained through continuous checking of the time/work plans of section heads and the current registration of materials used.

The testing and examining of blueprints in the Central Construction Office is done by the section heads. A quality control has not proved worthwhile.

During work upon a project, representatives of the customers and the Sea Register are in attendance at the Central Construction Office, in order to put forward their wishes and demands in good time.

The constructional group from the shipyard involved take part in the sea trials of a ship upon completion. The handover of a ship takes place during the sea trials in the presence of the quality control, the building control and the customer. At the delivery of a prototype ship, the head of the project is also present.

Advanced School

LENINGRAD Shipbuilding Institute (Technical ~~[illegible]~~).

This institute is the training centre for technical engineering personnel. Since 1930, it has been an independent shipbuilding institute, training engineers for the following branches of the profession:

(a) Shipbuilding, planning and designing.

(b) Machinery construction, designing and ships' installations.

(c) Engineers of the Faculty of Economics and factory administration.

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(d), Progressive additional training as shipbuilders and machinery constructors, through the University evening sessions.

In this connection a special plan has been formulated which presupposes practical training and places special emphasis on the theoretical side.

In addition to the good report, candidates for the Institute must have had two years' practical experience in a factory - three years in the case of technicians.

The training of engineers takes 5½ yrs where attendance at the University is during the day and 6 yrs for the evening faculty.

A Faculty of Shipbuilding has been set up at the Polytechnic Institute in NIKOLAYEV and REVAL.

The Ministry for Water Traffic and Inland Shipping has some navigation training centres and technical colleges under its jurisdiction.

The curricula, to a large degree, cover training for works employment. After the sixth term, the students enter a works and there receive training in shipbuilding. After completion of the eighth term, they undergo a more intensively specialised training and are furthermore required to spend some time at sea. They finally leave the university as certified engineers and highly qualified technicians and as such are absorbed in industry.

There are at present 13 students from EAST GERMANY at the Institute.

The following are usually required of engineers aiming at a diploma:

(a) The formulation of a project (plan):

(b) Work at a model basin.

It is not as a rule a question of purely educational projects but of actual problems set by industry which will subsequently materialise. The training of engineer economists is regarded as being particularly important. They are allotted to the following departments to acquire practical experience:

Designing office.
Operational.
Works Planning.
The economics of planning.
Administrative planning.
Director of labour.
Wages and work section.
Commercial director.

The advantage here is that they not only become fully conversant with the administrative side but become conversant with shipbuilding in addition.

Machine construction engineers are given a thorough insight into the electrical engineering aspect of shipbuilding. Electrical engineers for shipping are trained at special institutes.

There are 40 professorial chairs - technical and general - at the Institute, with numerous laboratories and workshops available to the different sections. The Institute's own model basin for educational and research work is 36 meters in length, enabling students in this special field to acquire a first class training.

All those studying are scholarship holders, the amount of which is in accordance with their needs and their efforts. Extra mural students are accommodated in boarding schools.

A visit was to be paid to the further sections of the Institute but as they are very extensive and fitted out with a great variety of equipment it was only possible to mention some.

(a) The library of the Institute comprises 200,000 volumes and additionally all trade and technical journals covering branches in which training is given are available.

(b) Laboratory for testing materials

Here there is available a great variety of equipment for the testing of material. There is equipment of many different types from a

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machine for breaking-tests to one for detecting signs of fatigue.

At the time of the visit tests were being carried out to detect signs of fatigue on welding seams. It was proved that welding seams could stand a bending strain of 14 kg/mm^2. In addition, welding points of titanium and copper were being given tests under various loads.

Paraffin mixed with vaseline is now used as grease material for launchings. Organic grease is no longer used. The necessary consistency is worked out beforehand. The laboratory director stated that in JAPAN, steel ball bearings are in use in launchings.

(c) Model Basin [redacted])

The Institute has a model basin at its disposal measuring 30 m long, 5.5 m wide and 3 m deep. It is in the main used for experiments for the education of students and also at times for research purposes. The necessary models are made in the workshops. Tests in propulsion are also carried out.

Colleagues of the institute remembered the visit in Feb 1957 of Colleague HENSCHKE that had been so profitable.

(d) Welding Laboratory

All machinery and appliances of the most modern development are available. The students are able to try out and get to know all appliances from gas welding to automatic welding. The institute can carry out contract welding on shafts up to a diameter of 60 mm.

(e) Laboratory for Diesel engines

The laboratory is located in the Hochschule together with that of steam engines and steam boilers. At the time of the visit, alterations were in progress whereby a large steam engine of a later type, together with the necessary boiler was to be installed. The laboratory space was full of building materials so that work was at a standstill.

For the Diesel laboratory itself, a relatively small space was available. Compared with other labs such as the electro technical, which looks as if it has several sets, the Diesel lab gives the impression of a real experimental ship. All engines available (very few unfortunately) were ready or being got ready for use.

The laboratory's main task at present is to clear up the proportion of load of two and four-stroked engines and research into the lessening of air intake without endangering the safety of the engine.

For test purposes the following is available:

(a) A quick running, four-stroke engine of the American firm BUDA, working on the LANOVA principle, for experiments dealing with air intake.

(b) An experimental BUCKAU-WOLF DZ 128 engine on which at the time an aspirant of the firm RUSKI-DIESEL was carrying out load trials with two inter-connected blast machines.

scavenging present disassembled)

(c) A smaller, two-stroke engine with crankcase [redacted] (at [redacted]

scavenging

(d) A small 2-stroke opposed piston engine of the firm JUNKERS ([redacted] experiments).

Scavenging

(e) An American two-stroke GMC engine with longitudinal [redacted].

booster

(f) An MWM Diesel RH 43 S with [redacted] (a forerunner of the DDR Type 6 KVD 43 being made in ROSTOCK).

The Central Diesel engine Institute, LENINGRAD (Director FADIN)

The institute has no buildings of its own, the main sections, together with other institutes being accommodated in a somewhat old establishment in the city centre, not far from the MOSCOW railway station. The available area for working is, in all, 1000 m^2, work being carried out in shops under very cramped conditions. Working conditions are somewhat better in a block of buildings near the city limits, some 6 km from the administration. It is here a question of an old railway station for horse-drawn traffic, covering a working area of 3000 m^2 and recently placed at the exclusive disposal of the Institute. According, however, to Director FADIN, at least 8000 m^2 in all are required for the present volume of work.

The Institute was inaugurated more than 30 yrs ago. It originated from a small group of engineers and scientists who, during the first World War, were occupied on a number of developments on behalf of the Army. There are at present some 300 people working at the LENINGRAD Institute, half of whom belong to the technical engineering personnel, the majority of the technicians consisting of specialists who have been practicing at the Institute for many years. Over a hundred members of the intelligentsia are said to be able to shew ten or more years of practice in their profession.

Partly in the centre of the city and partly on the outskirts, the Institute has at its disposal a somewhat small designing office, extensive testing shops, a whole series of special laboratories covering the most varied spheres of work and a small model building workshop.

The designing office is primarily devoted to the development of basically new test models which are subsequently subjected to meticulous testing in the testing shops. At the time of the visit they were busy with an engine of 25 hp cylinder performance by 750 revs/min. It has a bore of 180 mm and a piston stroke of 220 mm and operates by injection into a whirl chamber. The initial trials could be observed in the testing shops. It was stated that the results, as far as fuel consumption is concerned, were satisfactory.

Additional to engines, exhaust-gas turbo-superchargers in various sizes and a variety of types, are being developed at the Institute. A multi-cylinder two-stroke opposed-piston engine (twin-shaft engine) with about 150-170 mm bore and 2 x approx 180-200 mm piston stroke, was of particular interest. Nominal engine speed, n = 1500 revs/min. Intensive, fundamental research is being made into one cylinder and multi-cylinder engines, where work is being carried out on [redacted], pressure charging and pressure super-charging of two-stroke engines. scavenging

In experiments at the t esting shops measurements of all kinds and on an extensive scale, are being carried out with oscillographs, in which connection two central measuring installations are available, each provided with a 'nine-trace' oscillograph, made by SIEMENS. Special transmitters for measurements, with a very high degree of operational reliability and which do not require changing during testings of long duration, were being developed by the Institute.

A special laboratory with its own testing centre is busy on the development of gas-engines - according to the "OTTO" as well as the "Diesel" gas method - for the most varied types of gas, e.g.: gas in cylinders, coal gas, natural gas, producer (generator) gas, etc.

Another special laboratory is working on the elucidation of noise development in motors, and on noise control. It is in relatively primitive accommodation, insulated against sound, but nevertheless abundantly equipped with noise detection and measuring appliances (partly of English and partly of German origin).

A further laboratory, also provided with its own testing shop, is occupied on questions of remote control; of special interest at the moment is the remote control of the number of revolutions of multi-engine installations in ships with Diesel-electric propulsion, by the employment of three-phase (alternating) current. By this method the number of revolutions of the main generators must, as is well known, be regulated according to the speed of the ship. Special governors with servo-motors (detached, with drive from the generator shaft), and which catch the speed governor (adjustable from 0 to 6%) of the engines, have been satisfactorily developed. They are being built for electrical, electric-hydraulic and pneumatic operation. One of the governors (specially selected) works as "pacemaker".

A laboratory, with equipment for the imitation of working conditions, is occupied with questions of remote supervision. Development here was taking place, according to respective requirements or working conditions, on a whole series of measuring appliances and complete measuring installations for transmitting signals and giving measurable values. The work of this laboratory became necessary, because of neglect in this sphere of activity on the part of the measuring appliances industry essentially responsible, i.e. through a state of affairs which is also noticable in East Germany. The appliances developed are almost exclusively fitted with normal (constructional) elements of the measuring appliances industry or department of sound technique. Temperature regulators for cooling-water, and valves with pneumatic servo-motors for remote control, were also being developed at this laboratory.

A laboratory dealing with injectors, is conducting research into engine-priming procedure and the development of injector pumps and injection nozzles. It is relatively well equipped with testing stands of the most varied types for investigating injection procedure, jet improvement, etc. A smallish, one-cylinder pump with rotary drive (distributor pump) is at present in course of development. At the LENINGRAD Institute, three laboratories are working on the further development of measuring technique as applied to Diesel-engine construction. The first laboratory's work consists of the precise determination of pressures and temperatures. A series of transmitters with various ranges of measurement (various methods) was being developed for the measuring of pressure courses. The piston temperatures of running engines are determined by means of thermo-elements in the head of the piston. Measurement transmission (Uebertragung) follows by the closing of contacts in the lower dead centre, whereby errors in measurement are adjusted by a special switching system.

The second laboratory for measurement technique, is occupied with the measuring of changes of length. Together with a range of transmitters (capacity transmitters) for maximum changes up to 30 mm., appliances for strain gauge measuring with [redacted] charts are being specially developed. Amongst these, a portable appliance for tenso-metric measuring, consisting of 2 x 3 measuring units and a generator component with dimensions of about 60 x 50 x 25 cm. could be of particular interest. Rotating current collectors with mercury contacts are in course of development for transmission of the measurement values of shafts. The measurement values of components with reciprocating motion are transmitted by means of hawsers. The arrangement as demonstrated had already been in operation for over 40 hours by revolutions of n = 1500 Revs/min. in an engine with 170 mm stroke.

The work of the third measurement-technique laboratory, is the measurement of wear and tear, mainly through the medium of radio-active isotopes. A special testing room (suitable for smaller type engines) adjoins the laboratory, The increase in radioactivity of lubricating oil through the friction of radio-activated working parts is measured. Efforts are being made to increase the sensitiveness of the measuring instruments, in order that, by using weak beams, it will be possible to work with a minimum of anti-ray protection measures. It was reported that, with the available equipment, a whole series of reactions - e.g. the course of wear and tear by using heavy oil, the effect of cool water temperatures or of cold starting - were within a very short time authentically explained.

A further, well equipped and extensive laboratory is busy on research into lubricants and power fuels - chemical as well as physical. Testing rooms with special test motors are available in the laboratory. A workshop adjoins the Institute, not very large but abundantly equipped with universal machines, and with well trained personnel at its disposal. Almost all components necessary for experimental work, including complete one-cylinder test-engines and turbo-superchargers are made here.

It can, generally speaking, be affirmed that the Central Diesel Institute in LENINGRAD, which apparently cooperates with the 18 Diesel engine construction works in the SOVIET UNION, is qualified to make noteworthy contributions to the development of the, in some respects, still weak work of engine construction in the SOVIET UNION; this applies from the point of view of personnel as well as of equipment. The fundamentals of engine construction and allied fields of operation are intensively studied, whereas development in the designing of new engines is rather the work of the construction offices of the works themselves.

Additional to the LENINGRAD Institute, the BAUMANN Institute in MOSCOW under Professor TOLSTOW, is also engaged in research work on reactions, particularly in relation to fast running engines. The field of operation of this latter Institute was, originally, the development of aeroplane piston engines, but on the introduction of turbine and jet propulsion into aeronautics, this development was considerably curtailed or ceased altogether.

A comprehensive study of the Institutes for engine construction and of some of the leading engine works in the SOVIET UNION, would be of the greatest importance to EAST GERMANY.

KRYLOW - Institute LENINGRAD.

The KRYLOW Institute in LENINGRAD is a scientific institute, that deals particularly with all theoretical questions concerning shipbuilding. The Institute has recently been built and in effect constructional work is still going on. The final completion of the Institute is planned for 1959.

Apart from special installations, the Institute also has a large number of shipbuilding scientists. Theoretical and practical experiments are carried out in all scientific fields dealing with shipbuilding, and the knowledge gained is placed at the disposal of the industrial branch of shipbuilding in the U.S.S.R.

The following installations were examined in the Institute:-

a) Model Basin [redacted] for tugs.

This is [redacted] one of the largest installations for ship model testing [redacted] in the world. The large testing basin is 672 m. long, 15 m wide and 7 m. deep (i.e. depth of water). The plan is to extend this basin to 1350 metres in length. Two streamlined (sic) carriages [redacted] are available and can be driven at a speed of 10 metres a second or 20 metres a second.

For shallow water [redacted] tests the Institute possesses a further testing basin with a variable depth of water. This is 232 m. long, and 16 m. wide. A Carriage [redacted] with a speed of 6 metres a second is used for [redacted] towing tests on this stretch.

b) Cavitation laboratory. tanks or tunnels

Two cavitation laboratories were examined - one for the examination of propellors up to a diameter of 250 mm. and the second for propellors up to 500 mm in diameter.

It was stated by the Head of the laboratory that a special laboratory exists for the observation of the sea-worthiness of ships. For this purpose they have a basin 200 m. long, 70 m. wide, and a depth of 5 m. The models that are used for the experiments are remote controlled. The basin is equipped with all special installations, which make it possible to ascertain the backwash [redacted] effect, wave formation, bow wave formation, pitching movement, rolling movement, and listing movement.

c) Structural [redacted] and vibration laboratory.

In this laboratory there is a tension testing machine for 500 ton and one for 300 ton tractive - compression power. In addition there are 2 machines each for 400 tons pulsating loading tests, a [redacted] machine for a 600 tons load with a platform 4 metres wide and 2.5 metres high, photoelastic

For investigation of stress distribution

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having a removable middle section to allow/[redacted] to be carried out. Adjoining there is also a laboratory for optical tension and vibration experiments. Among the measuring instruments there is also a resistance [redacted] The values measured by this instrument are shown by an amplifier on various oscillating graphs.

Type strain gauge indicator

oscillograph

Optical tension tests on individual parts made to scale, such as deck sections for hatches, whole bulkheads and so on, make possible the ascertainment of the [redacted] magnitude of stresses and allow their [redacted] distribution to be determined. The models are made from plexiglass, and the [redacted] correction factors are used to [redacted].

transform the observations into corresonding values in steel

There are furthermore in the Institute special departments for the carrying out of different types of special calculations from which can be worked out corresponding norms, as also formula for stability, vibration, the most favourable ship's shapes and propellor dimensions, adjustable screws, jets and so on.

We were also shown an explosion tank used to investigate underwater explosions. The explosions were photographed with a cinecamera capable of taking 200,000 photos per second.

Automatic <u>Oxyacetylene cutting Automaton M D F K S</u>.

<u>Pictures No. 1 and 2</u>.

The Automaton is designed for the flame-cutting of sections to any shape required, from sheet steel. The cutting is carried out in accordance with diagrams scale 1:10. The diagrams are prepared in Indian ink on firm drawing paper. The drawing, which can be done by any undertaking, raises no difficulties. Presupposing a diagram of suitable quality, the automaton guarantees a degree of accuracy in cutting, not lower than that obtained by the employment of an oxy-acetylene flame-cutting copy machine. The main control of the automaton is connected to the operative mechanism by cable only, making it possible to instal the main controls in a separate room, with the mechanism erected in a workshop or in steel depot under a roof. In such circumstances contact is maintained between the worker servicing the main control and the worker operating the cutting machine by audible and light signals.

<u>Electrical principles and Rudiments of the Automaton M D F K S</u>

OU	Control-winding (Steuerungswicklung) of the electro-mechanical amplifier.
R	Rheostat for speed.
EMU	Electro-mechanical amplifier.
BS	Rotating-field-receiver.
SL	Feed-motor (engine) for the operative mechanism.
BD	Rotating-field transmitter.
FE	Photo-element.
FKU	Photostat-head.
POS	Potentiometer for speed changing.

During periods of operation, the automaton is serviced by two workers, under normal working conditions.

The employment of D F K S automatons, in place of oxy-acetylene cutting-machines operating by means of a copying appliance, results in considerable economy through the abolition of the copying appliance, the freeing of production space otherwise used for storing [redacted], reduction in the use of lifting appliances and transport otherwise necessary for the

patterns

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removing of copying stencils, and the lessening of drawing loft work.

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Technical Data

Dimensions of the plates to be cut:

Thickness	4 - 100 mm
Width	up to 2000 mm
Length	up to 9500 mm
Flame-cutting speed	up to 0.7 mm/min
Movement speed of the flame-cutter	up to 1.0 mm/min
Field of vertical movement of the flame-cutter	100 mm

Dimensions of the operational section of the cutting table of the machine:

Height	600 mm
Width	2155 mm
Length	12000 mm (3 sections of 4000 each)

Dimensions of the operative mechanism:

Height	1350 mm
Width	3190 mm
Length (with 3 section table)	13250 mm

Weight of the operative mechanism . . . . . . about 6100 kgr.

Dimensions of the main control apparatus:

Height	1942 mm
Width	1325 mm
Length	1975 mm

Weight of the main control apparatus . . . . about 900 kgr.

Potential power supply . . . . 380 volts.

Power required, in k.watts . . . . about 4.

Picture No. 3.

Machine 18 RA 1 is designed for the automatic flame-cutting of variously shaped sections from thick steel plate, in accordance with copy stencils.

The finger of the electro-magnetic head passes with rotating movement along the gibs (guide fillets) of a stencil firmly affixed to the machine table. The oxy-acetylene cutter, accurately following the movements of the electro-magnetic finger, carries out the cutting of the plate laid out on the cutting table.

The copy-stencils and the cutting table consist of sections, the number of which, is determined by the length of the plates to be cut.

On replacement of the copying-stencil plate (Tafel) by a copying straight-edge (Lineal) and by fitting additional flame-cutters, the machine can be employed for cutting out rectangular plates - or for cutting them into strips. When it is a question of rectilinear cutting, the machine can be used for bevelling the edges of the plate, to provide for a welded seam. The machine is equipped with four ordinary pattern flame-cutters, and a 'floating' flame cutter which automatically ensures a non-varying space between the nozzle and the upper surface of the plate to be cut; this is of importance when cutting plates with wavy upper surface.

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Technical Data.

Dimensions of the plates to be cut:

Thickness	4 - 100 mm
Width	up to 1600 mm
Length	unlimited
Cutting speed m/min	0.12 - 0.7 mm

Electro-magnetic head :

Diameter of the electro-magnetic finger	12 mm
Power of attraction of the magnet finger vis-a-vis the copying stencils	8-10 kg.

Electromotor of the magnet-head:

Type	SL-571 k
Current	Direct.
Voltage	24
Power	95 KW
Number of revolutions - Revs/min	2200
Track width of the mobile section of the machine	1900 mm
Height of tables -	
Copying table (Machine table)	800 mm
Cutting table	640 mm

Dimensions of the machine:

Width	3975 mm
Height	2000 mm
Length (2 section table)	8800 mm

Weight of the mobile section of the machine	346 kg.
Weight of the machine with tables to two sections	3240 kg.

Picture No. 4.

Machine for flame cutting 2 RA-M

The machine 2 RA-M is transportable and designed for cutting sections out of strong, pre-delineated steel plates. Rectangular cutting is effected by means of adjustable guides and circular cutting with the aid of a compasses contrivance (Zirkelvorrichtung).

The cutting-out of rings and strips can be accomplished when working with two flame-cutters, and additionally by adjusting the flame cutter under a corner the edges can be bevelled for welding purposes.

The machine is provided with a special contrivance for cutting a shaft. The 2 RA-M differs from other flame-cutters because of easier operating and better manoeuvrability. According to details furnished by undertakings using machines type 2 RA, their flame-cutting capacity is treble that of cutting by hand.

Technical Data.

Dimensions of sections to be cut:

Thickness	5 - 100 mm
Width - When cutting strips with 1 cutter	unlimited
When cutting strips with 2 cutters	up to 1100 mm
Length	unlimited

Cutting radius when using the Compasses-contrivance . .	400 - 1100 mm
Highest angle of inclination of the flame-cutter -	
When edge-bevelling for welding	40°
When cutting off a shaft	80°
Length of the guide-section	3000 mm
Number of guide-sections	3
Speed of the flame-cutter in m/min	0.15-08
Number of flame-cutters	2
Electric motor of the transporting vehicle:	
Type	SL 322 series reversible.
Current	Alternating
Voltage	110
Capacity in kilowatts	22
Number of revolutions - Revs/min	3600-4700
Dimensions of machine in mm.	225 x 300 x 390 (width with bar 1200)
Weight of machine in kilogr:	
with counter-weight	31.6
without counter-weight	24.4
Weight of guide section	28.5

Picture No. 5.

Transportable flame-cutting machines for cutting holes.

The machine is designed for the cutting of holes in cylindrical and conical containers, bulkheads with curves and double bottoms. It can also be employed for cutting out flanges and holes in cut plates and components. Holes can be cut in radial and tangenital direction, to an accuracy of ± 0.5 mm The set includes an appliances case with rectifier, and a current-reducing transformer for supplying current to the flame-cutter feed-drive.

Employment of the machine instead of a hand flame-cutter, precludes damage to the opening and the subsequent work this entails, thus considerably reducing the volume of work when cutting out openings.

Technical Data.

Diameter of the holes to be cut	40-300 mm
Thickness of the plates	10-30 mm
Precision of the flame-cutting	± 0.5 mm
Angle of inclination of the flame-cutter	± 45°
Electric motor :	
Type	SL-281 k
Capacity in k.watts	26
Voltage	24
Feed	Alternating current with 380 volts potential
Dimensions of the machine	870 x 925 x 1090 mm
Weight without appliances case and hoses	36.5 kg.
Overall weight	59 kg.

Picture No. 6.

Plant for the erection and automatic welding of T-girders STS-2-138.

The plant is designed for the erection and electrical two-sided direct current-arc-UP-welding of straight and curved T-crossection-girders with a height of 60-600 mm and a width of 40-250 mm. It can also be used for the erection and welding of double-T-girders with a height of 300-500 mm and a width of 250 mm.

The plant is mainly used for the welding on of members in the manufacture of stringers, deck beams, deck girders and other sections of the hull structure of a ship.

The prepared sections for the T-and double-T girders can be of any length, although not less than 1500 mm. The simultaneous centring of the prepared sections during the process of welding, and welding of both sides under the corner joint, proceed automatically.

Technical Data.

Dimensions of the T-girders to be welded:

Thickness		4 - 16 mm
Width		40 - 250 mm
Web		
Thickness		4 - 16 mm
Height		60 - 600 mm
Length of the T-girder		1500 mm and above
Lowest radius of curvature of the T-girder		2200 mm
Welding speed:	possible	30 - 90 metres/hour
	most suitable	45 - 50 metres/hour
Diameter of the welding wire (rod)		2 + 3 mm
Process speed of the welding wire		1 - 4 metres/min
Dimensions of the plant		20000 x 1300 x 2800 mm
Weight		2475 kg.

Picture No. 7.

Plant for the welding of round seams SKS - 1.

The plant is intended for the automatic direct current-arc-UP-welding of ring-shaped angle seams in horizontal plane (welding-on of flanges, wheels, end pieces to steel tubes, and bulkhead bushing). For the welding-on of wheels, and end pieces to tubing, the plant is equipped with a set of special appliances for holding the powder in case percussive-seams show on a vertical partition. During the welding process, the tube with the flange (ring, edge, end-piece) attached, is set up and made fast and immovable in a three-jaw chuck. The welding head moves automatically around the tube. The switching-off of the rotating mechanism of the welding head, is automatic in both end (final) positions.

The employment of the plant guarantees stable welding and increases the rate of work.

Technical Data.

Diameter of the tubes to be welded together	40-350 mm
Thickness of the tubes	2.5 mm and upwards
Length of the end-pieces to be welded on	up to 400 mm
Strength of welding-current	350-500 Amps
Welding speed (No. of revolutions of the table 0.4-4.0 Revs/min)	25 - 70 metres/hour
Diameter of welding wire	1.5 - 7.5 mm.
Dimensions:	
Diameter of the automaton	1200 mm
Height of the automaton	1770 mm
Equipment case	500 x 1070 x 1135 mm
Weights:	
Of the automaton	approx. 500 kg.
Equipment case	approx. 162 kg.

25X1

Picture No. 8.

Transportable boring machine with electro-magnetic support.

This machine is intended for boring holes in base plates of machines, bed plates as well as for boring large parts and articles which cannot be covered by stationary boring machines. The electro-magnetic support allows it to fix the boring machine at the boring point reliably and without additional equipment. In order to bring direct current in as simple a manner as possible to the electro-magnet, it is intended to take current from the welding machine transformers that are situated nearby.

The use of such machines does away with the need to use a lever as is customary with normal pneumatic boring machines. This considerably lightens the work and allows boring to be carried out without the workman needing a helper.

Technical Data.

Largest diameter than can be bored	32 mm
Greatest depth than can be bored	80 mm
Smallest interval between the middle of the borer and the wall of the part or article	50 mm
Horsepower of the motor	2.9
Air consumption	1.9 m^3/min.
Spindle revolutions	230 per min.
Direct current for electro-magnets	60 volts
Dimensions of the machine	180 x 300 x 435
Weight of the machine	28 kg.

Picture No. 9.

Transportable milling machine SPF-1.

The machine is designed to work right to the very edge of the article, and indeed for the sloping sides of right angled base plates of a ship's main and auxiliary engines. The machine can be set up immediately alongside or even on the foundation that is to be milled, and made firm with bolts, special clamps, or by electrical tack welding.

The frames of the machine are changeable (3 sizes lengthwise) and in addition it is possible to use 2 jointed frames. Machine SPF-1 is the modernised model of the MT-196. The machine is more comfortable and efficient in use and can be used for a larger range of work.

Technical Data.

Size: Upper surface dimensions which can be used when the machine is assembled	
Width	575 mm
Length:	
With frames 1500 mm long	1100 mm
" " 2000 mm "	1600 mm
" " 3200 mm "	2800 mm
" " 5200 mm "	4800 mm
The number of surfaces that can be worked on when the machine is set up	2 (on both sides of the frame)
Side inclination to the surface to be worked on	up to 1 : 50
Diameter of cutter	60 - 75 mm
Number of Morse cones of the spindle opening	4
Spindle revs per min	100 - 140 - 200
Vertical displacement of the spindle	120 mm

25X1

25X1

Feed (mechanical) mm/min	
b) working lengthwise	52 & 73
b) working lengthwise, accelerated	354 & 500
b) working crosswise	50 & 71
b) working crosswise, accelerated	345 & 485
Electric motor:	
Output	1.7 KW
Revs per min	1420
Dimensions of the machine in mm.	
With Frame length 1500 mm	1500 x 1440 x 860
" " " 2000 mm	2000 x 1440 x 1045
" " " 3200 mm	3200 x 1440 x 1045
" " " 5200 mm (put together)	5200 x 1440 x 1045
Weight of the machine.	
With Frame length 1500 mm	682 kg.
" " " 2000 mm	988 kg.
" " " 3200 mm	1322 kg.
" " " 5200 mm	1882 kg.

Picture No. 10.

Pipe bending machine STG-1.

The machine is designed to bend pipes cold with a curve radius of not less than 2.5 of the outside diameter.

The machine is driven by hand. The machine is equipped with a set of bending discs, guide-shoes and pins (pins need only be used for pipes that are more than 18 mm in diameter and less than 2 mm thick).

By using this machine a high quality of pipe-bending can be attained.

Technical Data.

Diameter of the pipe to be bent	14 - 32 mm
Length of the pipe to be bent	up to 4000 mm
Bend radius:	
for pipes of 14 mm diameter	35 mm
" " " 17-18 mm "	45 mm
" " " 22 mm "	55 mm
" " " 24-28 mm "	70 mm
" " " 32 mm "	90 mm
Dimensions of the machine in mm	1075 x 1685 x 5500
Weight of machine (without changeable parts)	ca. 200 kg.

N.B. The length of the pipe can be increased by lengthening the pins.

Picture No. 11.

Pipe bending machine with hydraulic motor - STG-2.

This machine is intended to be used for bending pipes in the cold state. The small dimensions of the frame of the machine make it possible to bend pipes in different planes. The machine is pedal-controlled, and has a steady, gradual speed control. When the machine is in use gauge pins with rollers are brought into play - this makes it possible to bend pipes without having previously greased the inner surfaces.

The withdrawal of the pin from the bent part of the pipe after the bending process is completed is effected by the use of a special hydraulic appliance. The machine is equipped with changeable bending plates, gauge pins and guide shoes for pipes of various dimensions and bend radii. It can be handled by one workman.

25X1

Technical Data.

Diameter of the pipe to be bent:	
a) steel	32 - 76 mm
b) copper and aluminium based alloys	32 - 105 mm
Radius of the bend of the pipe	70 - 250 mm
The largest angle of the bending plate	220°
Revolutions of the bending plate per min	0 - 1.25 (uniformly regulated)
Pump for hydraulic motor:	
Type	LIF 35
Performance in litres per min	35
Pressure	up to 65 kg/cm^2
Pump - electric motor:	
Output in KW	4.5
Revs	950
Dimensions of the machine without supporting beams . . .	1650 x 500 x 1140 mm
Weight of machine with electric motor	1600 kg.

25X1

Picture No. 12.

Machine for the turning of rings and overwinding of flanges for pipes SP-200.

The machine is designed for the turning (reverse turning of the faying surface, turning of the outer-diameter and reverse turning of the reverse surface), of thrust washers on tube ends to form flanged-socket connections, and for the removal of accumulated welding and soldering material in the area behind the tube-washer.

The machine can also be used for the reverse turning of flange upper-surfaces, edges, and end-pieces welded on to tubes up to a diamter of 200 mm. for which purpose the machine is equipped with interchangeable vices (gripping contrivances).

Pipes with thrust-washers are centred and secured by means of special interchangeable splayed gripping appliances and vices, whereas pipes with flanges, borders (edges) and welded-on end-pieces are gripped by prismatic vices. The Plan-support of the machine has the following feed methods:

a) Side feeding by hand, operative at both sides independent of the rotation direction of the spindle, and a mechanical feed towards the centre, only operative when the spindle is rotating.

b) Longitudinal feeding by hand, operative at both sides and functioning by moving the poppet (footstock) with the aid of a hand wheel.

The construction of the two vices and the gripping devices, permits the holding and securing of tubes without straight sections at the ends.

By using this machine instead of the generally employed method of filing, the quality of work in forming flanges and washers on tubes is increased, and in the case of washers there is resultant labour saving of 50/65%.

Technical Data.

Diameter of the parts to be processed	up to 200 mm
Size of the longitudinal feed	120 mm
No. of spindle revs. Revs/min:	
By the 1st washer stage	54, 69. 83
" " 2nd " "	120, 154, 195

25X1

Side feed of the turning tool (cutter) mm/hour	0.5
Electrical motor of the machine:	
Power in KW	1.0 (?)
No. of revs	930 revs/min.
Dimensions of the machine	650 x 1400 x 1600 mm
Weight of the machine	approx. 1070 kg.

Picture No. 13.

Tube flanging machine.

The machine is designed for forming flanges on the ends of pipes for elastic connections (rubber high pressure hose).

The forming of flanges is effected by means of 2 rollers (Rollen) set into motion around a stationary fixed tube. One roller is fitted to the outside of the tube, the other roller receiving automatic feed inside the tube, in the direction of the outside roller. The flange forms between the side-surfaces of the rollers. The employment of the machine ensures quick and high quality beading.

Technical Data.

Inside diameter of the tubes to be processed	25 - 100 mm
Greatest thickness of pipe-walls	2.5 mm
No. of revs. of the face plate	121.6 per minute
Feed motion of the pressure roller	0.066 mm/hr.
Electro-motor:	
Power	0.62 KW
Revolutions	1400 per min.
Dimensions of the machine	328 x 470 x 640 mm
Weight of the machine	70 kg.

Picture No. 14.

Machine for winding insulation tape around pipes.

The machine is designed for the insulating of straight and curved pipes in workshops, with asbestos-magnesium tape and asbestos flaky tape. The tape is run-off from a previously wound spool by means of a disc with three rollers which centre the pipe. The pipe-ends are held by two tubular pillars provided with hinges. A spool-brake regulates the tautness of the tape. A cowl, connected to the workshop ventilator, is placed over the machine to suck off dust during winding. By using the machine instead of hand-winding, there is a saving in labour of about 60% - 75%.

Technical Data.

Diameter of the pipes to be insulated	25 - 125 mm
Thickness of the tape	16 - 25 mm
Number of revs. of the winding disc	40, 60 and 80 per/minute
Stock in meters of spooled tape	50 - 60
Pipe-covering capacity of the machine in metres/min . . .	0.8 - 1.5
Electric motor:	
Power in KW	0.6
Revs/min.	1410
Dimensions of the machine	910 x 1500 x 2100 mm
Weight of machine	360 kg.

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Picture No. 15.

Hydraulic Presses for treating pipes - PG 50 and PG 100

The presses are designed for working on pipes, e.g. bordering of pipe ends in flanges or rings (for loose flanges), recutting of pipes and of the seating (bearing surface) of flanges including incising of packing grooves, bordering (edging) of pipes for loose flanges, tapering off and widening of pipes for provisional connections, flanging of the pipe ends for flexible connections (high-pressure rubber hose), edging (flanging) of sleeves made from pipe ends on to pipe-conduit "welded-on" points and flanging of pipe-collars for pipe outlets. The presses can also be employed on other similar work requiring horizontal machining. The presses are provided with an arrangement for the mechanical treatment of flanges on pipes. The clamping of the pipes, the bringing forwards and backwards of the pressure piston and the thrust and return of the cutting and turning-gear is effected by means of hydraulic contrivances. The presses are equipped according to the wishes of the purchaser; for edging, tapering and widening and flanging; the same applies to the inserts for the clamping (chucking) contrivance.

Technical Data.

	PG 50	PG 100
Maximum power of the main press (tons)	50	100
Longitudinal thrust in mm of the main press	475	350
Longitudinal speed of the main press mm/min:		
in operation	700	700
on withdrawal	2300	2300
Diameter in mm of the sections to be gripped (chucked):		
Pipes	22-155	28-300
Flanges and rings	56-195	-
No. of revs. of the face plate for the turning contrivance Revs/min:	84, 112 & 150	84, 112 & 150
Thrust of the turning tool:		
Mechanical mm/hour	0.18	0.18
by hand b/1 Rev/min., mm		
with stationary face-plate	7.65	7.65
With face-plate revolutions		
n_1 = 84	4.2	4.2
n_2 = 112	6.6	6.6
n_3 = 150	7.5	7.5

Picture No. 16.

Test stand for testing the tightness of Ventilation Pipes and Ducts.

The test-stand is designed for testing the tightness of welded seams on ventilation pipes. It consists of a bench with gripping contrivances, a control desk, and a set of caulking caps, packing (jointing) and clamping grips (pipe turn-buckles). A flange of the pipe is pressed firmly to the bench (on which a special rubber packing has been spread) by means of the quick chucking contrivances. The other end of the pipe and its offshoots are rendered impermeable by means of caps to which rubber caulking has been affixed. Compressed air is passed into the pipe under test, through a tuyere (Rohrstutzen) set up in the middle of the bench. There is a regulating valve and a manometer at the control desk for air-pressure regulating. To ensure safety whilst testing, the compressed air main-conduit is provided with a safety valve. The employment of the test-stand considerably facilitates and simplifies the process of testing.

Technical Data.

Dimensions of the flange of rectangular ducts:	
lowest dimensions	135 x 206 mm
highest dimensions	350 x 790 mm
Number of rectangular caps	9
Diamter of the flanges of round pipes:	
lowest	106 mm
highest	760 mm
Number of round caps	5
Testing pressure of the air, kg/cm^2	0.2 (?)
Dimensions of the testing stand:	
Table	600 x 1100 x 1550 mm
Control desk	195 x 205 x 250 mm
Weight in kilogr.:	
Table	280
Control desk	4.2

Picture No. 17.

Transportable, adjustable installation for expanindg (beading) boiler tubes.

The apparatus is designed for the expanding (beading) of tubes in the drums/collectors of steam boilers. The compressed-air arrangement, at one end in the form of a long bar with motor and at the other end as angle-drive with rolling appliance can, when secured together on a carriage, move in the direction of the longitudinal axis of the drum/collector.

The two sections of the drive counterbalance each other, the hands of the operator thus only having to take the force of the feeding (ram) device. The design of the installation provides unimpeded entry for the roller-expanding (beading) of any particular tube in the drum/collector. The motor is operated by remote control from the installation. The employment of the plant considerably improves working conditions and increases output.

Technical Data.

Greatest diameter of the tubes to be beaded	57 mm
Number of revolutions of the beading apparatus,	
Revs/min: running to right	108
running to left	96
Type of engine	Reversible piston air-engine SMR-50.
H.P. of engine	2
No. of revs. of shaft, loaded, Revs/min:	
running to right	185
running to left	165
Weight in kgr.	130

Picture No. 18.

Electrical Erosion Plant TD 4-M.

The plant is designed for the cutting out of openings and surfaces to any shape by means of electrical erosion, to a depth/thickness of 10 mm in hollow or solid material of any composition.

The cutting is effected by electrical discharge, originating between a special electrode tool and the upper surface of the work-piece. The agent is water.

Technical Data.

Limit of the opening to be cut out	10-180 mm
Dimensions of the work-pieces	up to 400 mm
Depth/thickness of the opening	up to 10 mm
Power necessary	6 KW
Current	alternating 127/220 Volts.
Dimensions of the plant	1723 x 640 x 740 mm
Weight of the plant	375 kgs.

Picture No. 19.

Transportable Apparatus for cutting with electric sparks MD-4.

The apparatus is designed for the cutting-out of openings, cavities, slits and grooves in metals of any hardness or strength by means of electric sparks. Metal removal from the surface of the blank takes place through the medium of electrical discharge, which originates between a special electrode tool and the upper surface of the metal to be cut. Water is the usual medium, but in cutting openings of precise measurement, oil and kerosene are used.

The plant consists of a head for the automatic feeding of the electrode tool, an electric control desk and a vat for the working-medium liquid. When transporting or storing the machine, the vat serves as its container.

The head is attached to a stand, the base of which serves for securing the metal to be cut. When working on large sections, the stand together with the head, can be fixed to these direct.

Technical Data.

Maximum power required	1 KVA
No. of machining methods	2
Current	Alternating 127/220 V
Rate of metal removal, when machining with a brass-electrode tool, cub.mm/minute:	
Steel sections in oil	40-60
" " in water	30-50
Hard alloy in oil	10-30
Working 'hub' of the electrode tool	80 mm
Dimensions:	
Head	600 x 340 mm
Control desk	380 x 210 x 300 mm
Weight:	
Head	4.75 kgs.
Control desk	18.60 kgs.
All-in weight of the apparatus	39.40 kgs.

Picture No. 20.

Steel-pyrites (Kies) centrifugal installation for plate descaling.

The plant is designed for removing scale and rust from steel plates. It consists of a chamber with centrifugal apparatus, elevator, separator, consumption bunker, plate transporting mechanism, control mechanism for the proportioning appliances, loading bunker, distribution box, Ventilator, wind sifter and control platform. The arrangement of the plant ensures even movement of the plate through the chamber, with cleansing simultaneously on both sides and in its entire breadth through the automatic performance of all incidental operations, such as separation and removal of used steel pyrites, removal of cleansing residues, reintroduction of steel pyrites into the consumption bunker, cleansing of air to be withdrawn by suction, etc.

The plant is operated by a single workman with centralised control from the control platform, assisted by an underworker who, with the aid of lifting devices, brings along the plates to be cleaned and attends to their subsequent removal.

Employment of the steel-pyrites centrifugal-plant replaces 16-18 sand-blast machines and reduces cleansing costs by 80% .

Technical Data.

Dimensions of plates to be cleansed:	
Thickness	3-30 mm
Width	up to 1900 mm
Length	up to 8000 mm
Weight	up to 4000 kgs.
Capacity (when cleansing plates 1900 mm wide) m^2/h :	
of steel St. 3	200-220
of steel SHL	120-150
Motive speed of the plate, m/min	1
Granulation of the steel-pyrites (GE round)	0.6-0.8 mm
Wastage of steel-pyrites, kg/h	12 - 15
Service life of the plant shovels	80 hours
All-in power of the electric motor	68.5 KW

Picture No. 21.

Angle attachment for Drilling Machine USN - 5.

The angle-attachment is designed for boring small holes in places difficult of access.

It is used together with the compressed-air boring machine RS-8 to which it is attached by means of a screw clamp.

Technical Data.

Diameter of bore:	Largest	5 mm
	Smallest	3 mm
Transmission angle		20^o
Number of drill-chucks for gripping the drills		3
Dimensions of the angle attachment		290 x 75 mm
Weight of angle attachment		1.0 kg.

Picture No. 22.

Pneumatic screwdriver GP-14.

The screwdriver is designed for screwing and unscrewing screws from nuts and bolts in assembly and erection work. The tightening and loosening of the nuts and bolts is effected by means of a cam-controlled impact mechanism, driven by a reversible compressed air engine. Change in rotation direction is carried out by a throw-over switch fitted into the back of the screwdriver. The machine is equipped with a set of interchangeable socket wrenches.

By using this machine instead of ordinary screwdrivers, the assembling and dismantling of bolt joints can be accomplished in half the time.

Technical Data.

Highest screw thread diameter for bolts and nuts	14 mm
Number of impacts of the cam mechanism per min.	1600
H.P. of the compressed air engine	0.2
Number of revolutions -do- Revs/min.	7000
Compressed air consumption cbm/min.	0.3
Dimensions of the machine.	270 x 175 x 60 mm
Weight of machine	2.3 Kgs.

Picture No. 23.

Pneumatic Angle-Screwdriver UPG-16.

Screwdriver UPG 16 is designed for the unscrewing, screwing off, in and out of nuts and bolts in places difficult of access, during assembly and erection work.

The tightening and loosening of the nuts and bolts is effected by means of a cam-controlled impact mechanism driven by a reversible compressed air engine. Change in direction of rotation is effected by means of a throw-over switch fitted to the handle of the screwdriver. The machine is equipped with a set of interchangeable socket wrenches.

By employing this machine in erection work, output is increased to 2-5 times that of similar work by hand.

Technical Data.

Highest screw-thread diameter	16 mm
Smallest distance from bolt-centre or side of the object	20 mm
Number of impacts of the cam mechanism per min	1250
H.P. of the compressed-air engine	0.4
No. of revs -do- (loaded)	4000 Revs/min.
Compressed-air consumption cbm/min	0.7
Dimensions of machine	65 x 125 x 420 mm
Weight of machine	about 3.5 kgs.

Picture No. 24.

Pneumatic screwdriver with Cardan Joint UNG - 8.

The angle-screwdriver is designed for tightening and loosening nuts and bolts in closed-in positions and difficult of access. The basic principle of this design is the use of the pneumatic screwdriver GP 14 with supplementary Cardan-joint. The machine is equipped with socket wrenches for nuts M 6 and M 8.

The use of the pneumatic screwdriver instead of any other type of key lessens the use of physical effort by 2 or 3 times.

Technical Data.

Biggest winding diameter of nuts and bolts	8 mm
Biggest angle of inclination of the link	40°
Smallest distance of the middle of the bolt to the wall of the product	12 mm
Size of the machine (with attachment)	425 x 77 x 70 mm
Weight of the machine (with attachment)	3.5 kg.

25X1

Picture No. 25.

Compressed-air driven, reversible angled steel-brush
UP - SCHTSCHA-R-1.

The machine is intended for the de-rusting of metal and the removal of loose deposits and old paint. It is also used for the cleaning of welding seams and the cleaning of cast pieces and other parts. The machine is driven by an engine which is powered by compressed air.

A steel-wire brush-head which can be dismantled serves as the working tool. The periodic change of turning direction of the brush lengthens its life considerably.

The use of this brush for de-rusting a ships hull enables the physical effort required for this type of work to be considerably lessened.

Technical Data.

Diameter of the steel wire brush	100-110 mm
Revs/min of the steel wire brush (in use).	2500-3000
Capacity of the engine in H.P.	0.7 - 0.8
Consumption of compressed air cu.cms/min	9.0
Measurements of the machine (without protective shield and brush)	370 x 74 x 119 mm
Weight of the machine (without brush)	3.4 kg.
Weight of the brush	0.35 kg.

Picture No. 26.

Compressed air Hand Rivet Press PRP 5-2.

The press is for use in riveting constructions in fine metal sheeting.

It consists of a cylinder and a gusset mechanism which converts the movement of the piston into a pressure piston.

The use of the press enables work to be carried out where the access to the position of the rivet is difficult. It also increases the capacity for riveting some five times in comparison with a compressed-air hammer. The press is fitted out with a set of pressure pistons.

Technical Data.

Maximum diameter of rivets:	Light metal	5 mm
	Steel	4 mm
Maximum thickness of the pieces to be riveted together		4 mm
Cramp-width		30 mm
Largest distance between the pressure pistons		32 mm
Highest force developed by the press		4000 kg.
Consumption of compressed air for 1 rivet in cu.cms . .		0.006
Measurement of the press		445 x 220 x 120 mm
Weight of the press		6 kg.

25X1

Picture No. 27.

Device for holding EXPANSIT during sticking.

25X1

The device is used for the pressing-on of sheets of insulating material whilst sticking same to spans and areas and frames of bulkheads (and other places) which are to be insulated.

The sheets, which have been painted with an adhesive material, are laid on the area which is to be insulated, and are pressed-on to the area by using cramps padded with wood. The sheets remain in this position until the adhesive material has dried.

The use of this device makes work of this type easier and more comfortable. The results are also better.

Technical Data.

Jaw-width of the cramps:	Maximum	140 mm
	Minimum	75 mm
Weight	. . . .	2.2 kg.

Picture No. 28.

Universal Jig for flanges and rings.

The jig is used for boring holes in pipe-flanges, pipe-supports as well as in round points of projection welding and rivet flanges.

The flange is centralised and fixed in a three-jaw chuck which is fastened to a rotatable divided table, which is arranged in accordance with the number of holes to be bored and their position. The jig is controlled by a guide-bush which has been set to a required radius using a vernier and scale.

By using this device one does away with the necessity of making a separate special instrument for every flange measurement.

Technical Data.

Diameter of jig	13, 15, 16, 17, 22 and 26 mm.
Number of holes to be bored in flange .	4, 6, 8, 10, 12, 14 or 16.
Exterior diameter of flange	95 - 480 mm.
Greatest distance between the middle of the jig and the middle of the hole to be bored	225 mm.
Size of the machine	850 x 405 x 445 mm
Weight of the jig (without guide bush)	162 kg.

Picture No. 29.

Milling head for the cutting-out of holes in pipes.

The milling head, together with the special vice is designed for the milling-out of openings in the walls of steel and copper pipes using an end milling cutter.

The milling-cutter is secured in the milling-head and is then mounted on the spindle of the boring machine. The driving tooth gear of the milling-head is connected to the spindle of the boring machine through a truncated cone. By use of a hand-feed mechanism the milling-head is made to rotate round the spindle-axle in the set contour of the opening to be cut out.

25X1

For the cutting-out of openings which are not circular the feed movement of the milling-cutter is coordinated with a feed movement of the vice in which the pipe is fastened.

25X1

The use of this milling-head cuts down by approx 3-4 times the manual effort in cutting-out openings in pipe-walls.

Technical Data.

Diameter of a cylindrical opening to be cut:
- Smallest . . . . 10 mm
- Largest . . . . 226 mm

Greatest measurement of a non-cylindrical opening to be cut . . . . 226 x 376 mm

Greatest pipe-diameter which can be held in the vice . . . . 220 mm

Time required to cut an opening in a pipe with a diameter of 90 mm and a wall thickness of 3 mm :
- In steel pipes . . . . 2.5 minutes.
- In copper pipes . . . . 1.0 minutes.

Weight of the vice . . . . 75 kg.

Weight of the milling cutter . . . . 20 kg.

Picture No. 30.

Dynamometer for Load Measurement.

The dynamometer is intended for the measurement and regulation of weight-loading on the step bearing during the fitting of the transmission shaft (likewise during the fitting of a main engine) in accordance with load-values which have been determined during testing.

The dynamometer is screwed into the bottom side of the bearing or mechanism. The amount of load on each dynamometer is shown on a dial in accordance with the pressure on a cup-spring balance.

The accuracy of the measurement shown on the dial when regulating the load from the smallest to the greatest is 1%, and from the greatest to the smallest it is 5%. The dynamometer is made in 6 types.

Technical Data.

Detail	Type I	Type II	Type III	Type IV	Type V	Type VI
Top capacity - Kg	1000	2500	2500	4500	6000	10000
Length of housing in the threaded part - mm	58	58	32	70	92	85
Thread on the housing (mm)	Trape: zium 24 x 2	M 24 x 3	M 24 x 3	Trape: zium 30 x 30	Trape: zium 36 x 3	M 42 x 42.5
Measurements (mm) First figure as diameter.	53 x 185	55 x 190	55 x 162	75 x 260	75 x 287	96 x 318
Weight (kgs)	1.2	1.6	1.2	2.7	3.7	8.3
Bearing diameter of the transmission shafting (mm)	180 x 220	240 x 300	240 x 300	320 x 380	400 x 460	480 x 520

25X1

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Picture No. 31.

Wedge-Jack.

The wedge-jack is used for exact perpendicular movement during final fitting of engines. For measurement of the lift there is a vernier scale.

The jack is operated by a rachet handle.

The use of the jack greatly helps the process of positioning and lining-up of the engine, makes the work of the mechanics easier and improves the quality of the assembly work.

Technical Data.

Maximum lifting power	20 tons
Maximum lifting height	5 mm
Scale divisions of the vernier	0.1 mm
Force which must be used on the rachet-handle to lift a weight of 20 tons	45 kg.
Measurement of the jack	357 x 160 x 70 mm
Weight of the jack	9.2 kgs.
Weight of the handles	5.2 kgs.

Picture No. 32.

Spring-pin Thermo-Couple [redacted].

The thermo-couple [redacted] is intended for the measurement of the temperature of warmed parts made of copper or copper-alloy. When it is necessary to measure the temperature of steel parts (steel products) an adjustment must be made in accordance with a chart kept in the laboratory which includes every type of steel.

The chromo-aluminium spring-pin electrodes of the thermo-element which are separated from each other, are connected to a meter which is mounted on the housing. This meter has a scale marked in °C. To clean the top surface of the metal from oxide (at the point where the spring-pin electrodes will make contact) emery-pins are fitted to the head of the thermo-element.

The use of the thermo-element enables the measurement of temperatures of warming parts to be done speedily and accurately.

Technical Data.

Sphere of temperature measurement	100 - 1100°C
Accuracy of measurement (Copper)	± 10
Speed of registration	3-5 secs.
Measurement of the thermo-element	1130 x 187 x 80
Weight (without case)	2 kg.

Picture No. 33.

Electric pouring pan for sealing the seams on deck covering.

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The electric pouring pan is for use in sealing seams in wooden deck covering with melted pitch. The electric heating element of the pan enables the sealing to be done with the pitch at a constant temperature (approx. 150 - 170°C). This makes the work much easier.

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Technical Data.

Capacity of the pouring pan	2.5 kgs.
Required power	1.0 KW
Current for the heating appliance - direct current .	36 volts.
Measurement of the pan	160 x 250 x 575 mm
Weight of the pan: without pitch	4.5 kgs.
with pitch	7.0 kgs.

Picture No. 34.

Ruler for dents.

The ruler is used for measuring the size of dents in plates and flat surface constructions. A vertical scale is used for measuring the depth of a dent.

The use of this instrument enables dents to be measured quickly and accurately - a very important factor during the rolling process.

Technical Data.

Maximum measurement of depth	30 mm
Length of the ruler	1000 mm
Division of the measuring scale	1 mm
Division of the ruler	10 mm
Weight of the instrument	0.95 kgs.

Engines of the firm RUSKI-DIESEL.

Type D 30/50 for stationary plant.

Type DR 30/50 as ships main engines.

General.

Engines types D 30/50 and DR 30/50 are two-stroke plunger-piston engines without compressor and with direct engine priming.

The engines are built for ships and for stationary operation, with 4, 6 and 8 cylinders. The nominal cylinder power is 100 HP. These engines are widely employed in the most varied branches of industry. The reversible ships engines are built into ocean-going and inland vessels of various types, as main engines for direct drive of the screw-propeller. The non-reversible engines are normally designed for generator driving. The engines run on solar oil (GOST 1666-51), or Diesel power fuel GOST-305-42. Engine oil mark T (GOST 1519-42) is used for lubrication. Awtol 10 - purified with sulphuric acid - (GOST 1862-51) can be used as substitute. Compressed air is used for starting.

Characteristics of the engines D 30/50 and DR 30/50.

Description	4 D 30/50 4 DR 30/50	6 D 30/50 6 DR 30/50	8 D 30/50 8 DR 30/50
Nominal power in H.P.	400	600	800
No. of revolutions by nom. H.P.	300	300	300
Transitory maximum capacity (max. 1 hour) in H.P.	440	660	880

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No. of revs. by maximum capacity for stationary Diesel	300	300	300
for ship's Diesel	310	310	310
No. of cylinders	4	6	8
Cylinder bore in mm	300	300	300
Piston stroke in mm.	500	500	500
Mean piston speed in m/sec	5.0	5.0	5.0
Mean effective pressure in kg/cm^2	4.25	4.25	4.25
Compression in kg/cm^2 (minimum)	32	32	32
Maximum timing pressure (Zuenddruck) by nominal power, in kg/cm^2	62	62	62
Average exhaust temperature by nominal power in °C.	290	290	290
Scavenge air pressure in ATU	1.2	1.2	1.2
Specific fuel consumption by nominal power in g/PSeh (Max)	185	185	185
Hourly lubricating-oil consumption in kg/h (max)	2	3	5
Specific cooling-water consumption by entry temperature of max. 25°C in l/HPeh	25	25	25
Minimum air pressure for starting the warm engine, in kg/cm^2	10	10	10
Flywheel (centrifugal) moment (GD^2) of the engine with shaft turning-gear, in kgm^2	5[illegible]4	608	694
Degree of irregularity of the crank-shaft	1/15	1/36	1/58
Free forces of the rotating masses in kg.	4.0	48	?
Free moment of the rotating masses in mkg.	610	20	675
Free forces 1st order of the oscillating masses in kg: stationary engine	1626	1626	1686
ship's engine	1492	1492	1552
Free moment 1st order of the oscillating masses in mkg: stationary engine	1800	2435	520
ship's engine	1939	2236	416

25X1

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Free forces 2nd order of the oscillating masses in kg: stationary engine	520	520	537
ship's engine	476	476	495
Free moment 2nd order of the oscillating masses in mkg: stationary engine	2278	1304	3292
ship's engine	2270	1350	3420

The piston, of alloyed grey cast-iron, is uncooled and has five piston rings and two oil-retainer rings. The cam-shaft, running in bronze shaft bearings is driven by the crank-shaft over spur-gearing. The symmetric shape of the cam-discs makes possible the working of the injector pumps of the reversible engine, by headway or sternway movement of the vessel. The injector-pumps provided for each individual cylinder, are fitted to the cylinder-block. The fuel feed is regulated by changing the closure timing of the sucking valve, during the compression-stroke of the piston. In the case of ships' engines, fuel is fed to the pumps by means of a special feeding-pump, driven by the cam-shaft.

The injector valves (closed nozzle) have oil-cooling. The opening pressure of the injector valve needle is 220 kg/cm^2. There is flash atomization. The fuel system is provided with a double-sieve filter for rough-cleansing the fuel; the filter is employed from the outside of the engine. Filters are furthermore provided for fine-cleansing; these are stream-line filters which are screwed into the injector valve body.

Sliding parts are oiled by means of a spurwheel pump fitted to the end of the engine. The cylinders are greased with fresh oil by means of lubricating apparatus operated by the engine. The circulation oil is cleansed by a double sieve filter; this can also be effected when the engine is running. For oil-cooling, there is a 'Lamellen' oil-cooler on the engine. The pressure in the lubricating-oil system does not exceed 3 kg/cm^2. A piston pump is provided for cooling the ships' engines with seawater. The stationary type of engine does not, in normal finish, have a cooling-water pump; they are cooled by means of a separate water supply. For special plant, stationary and ship's Diesel engines can be supplied with cool-water pumps. The pressure in the cooling system amounts to 0.3 to 1 kg/cm^2.

As a protection against corrosion of parts coming into contact with water, ships' Diesel engines are provided with zinc protection.

The engine has cross-flushing without valves. The double-acting piston scavenger-pump with slide valve motion, is operated by crank gear from the crankshaft. To start the engine, compressed air with a maximum pressure of 30 kg/cm^2 is used.

Description	4 D 30/50 4 DR 30/50	6 D 30/50 6 DR 30/50	8 D 30/50 8 DR 30/50
Weight in tons of the engine without water or oil	15	18.5	26
Weight in tons of engine with water and oil.	15.5	19	27
Weight in kg. of the heaviest construction group (cylinder block)	2990	4476	5962
Constructional height for the piston, above base upper-edge in mm	3300	3300	3300

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Outer dimensions of the engines D 30/50 and DR 30/50.

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Type of engine	Outer dimensions in mm					
	A	B	C	D	E	F
4 D 30/50 4 DR 30/50	3385	1665	3220	220	570	1100
6 D 30/50 6 DR 30/50	4345	1565	3220	220	570	1100
8 DR 30/50	5610	1627	3257	220	570	1100

Brief descritpion of the construction.

The engine-casing is of the cast iron, block style. Cast iron cylinder liners are inserted, with rubber and copper-ring packing. The single cylinder-heads for each cylinder are attached to the block with set-screws. Each head is provided with an injector valve, an outlet valve, an indicator cock with safety (signal) valve and a thermometer for measuring the cooling-water discharge temperature.

The crank-shaft, forged in one piece out of carbon steel, is bedded in the bearings (- babbitted (bushed) with white metal -) of the base plate. A bore in the round connecting rod conducts the lubricating material to the bronze bearing of the connecting-rod head.

The removable lower head of the connecting rod, with white metal outlet, is completed in two parts as a steel swaging piece without bearing brasses.

For loading the starting-air tanks, the cover of the scavenge-pump is provided with a compressor, the power of which suffices for filling a tank of 400 litres content within an hour, by a pressure of 30 kg/cm^2. The compressor has an automatic switching-off device, which operates on reaching 30 kg/cm^2.

The direct-acting, single-stage centrifugal force-governor is at the end of the cam-shaft on the driving side.

In the case of stationary engines for generator driving, the governor guarantees - independent of the burden carried by the engine - a non-varying number of revolutions of 300 Revs/min. Through the medium of the governor, the parallel running of several similar type Diesel generators, by alternating load, is possible.

In the case of ships' engines for direct screw-drive, the only effect of the governor, is to limit the maximum number of revolutions. Changes in the number of revolutions are here effected by varying the fuel feed. Starting, stopping, operating and reversing of the ships' engines is effected from the steering-stand at the front of the scavenge pump.

The manometer chart is above the steering-stand, at the front of the engine. The number of revolutions of the crank-shaft is controlled by means of a tachometer, situated at the front of the engine near the steering platform.

A pyrometer is supplied with each engine, for measuring the exhaust-temperature of each cylinder.

Hand-turning gear with detachable lever, is used for the turning over of the crank shaft.

A complete engine delivery includes compressed-air vessels, a set of spare parts, and special tools and appliances for dismantling and assembling the engine in a workshop.

25X1

25X1

Stationary engines are equipped with exhaust dampers and fuel tanks, together with anchor bolts for securing the engine to its base.

If specially ordered, engines can be equipped with measuring appliances (mechanical indicators and 'Pi-meters') for controlling the running of the engine.

The standard models of stationary engines (6 D 30/50 and 4 D 30/50) are delivered with alternating-current generators.

Features of the engine 6 D 30/50 with Generator.

Type of generator	MSD 323-5/20
Capacity of generator	400 kw
Voltage	6000/3000, 400/230, 525/300 V
Total of flywheel (centrifugal) moment of the unit GD^2	3608 kgm²
Degree of irregularity	1/213
Flywheel (centrifugal) moment of the generator GD^2	3000 kgm^2

Features of engine 4 D 30/50 with generator.

Type of generator	MSD 322-6/20
Capacity of generator	270 kw
Voltage	400/2[illegible]
Total centrifugal moment GD^2	44[illegible] kgm
Degree of irregularity	1/[illegible]
Centrifugal moment of the Generator GD^2	3900 kgm^2

In one of the standard types, the engine 4 D 30/50 with alternating-current generator is erected on a special engine frame (bed plate).

Diesel driven generator DRA 1 of the firm RUSSKI-DIESEL, LENINGRAD.

General.

The diesel driven generator DRA 1 consists of 2 engines of the type 8 DR 43/61, a gear drive with hydraulic clutch of type 2G3-222 and a central control stand.

The diesel driven generator is built to serve as the main engine installation of ships, and is only intended to drive the propellor shaft.

The nominal output is 3800 HP at 84 revs per min. The engines 8 DR 43/61 each with an output of 2000 HP at 250 revs per min. are directly reversible.

The gear drive type 2G3-222 is a one stage double reducing drive with fluid clutch and built in main thrust bearing to take a propellor thrust of up to 60 tons.

The engines work on inferior quality petroleum GOST 1666-51 or GOST 1519-42.

The diesel driven generator is delivered complete with auxiliary mechanism such as electric pumps for oil and water, filters for oil and fuel, oil cooler, air cylinders for the starter and exhaust damper.

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A. Generator DRA 1. [redacted]

1) Nominal output on the flange for the propellor shaft... 3800 HP [redacted]

2) Propellor shaft revs. with nominal output .... 84 per min.

3) Turning direction of the propellor shaft when seen from the rear .... right (clockwise for course 'ahead'). 25X1

4) Time needed to reverse the propellor shaft with the engine:

   a) with the hydraulic clutch engaged (for slow and middle speeds) .... max. 15 sec.

   b) with the hydraulic clutch disengaged, reversing the engines in neutral and subsequent engaging of the hydraulic clutch... max. 30 sec.

5) To reverse the propellor shaft with the help of the hydraulic clutch, time needed .... max 25 sec.

6) The generator has no governor speed range from 90-258 revs. per min.

7) Weight of the generator:

   a) without panels and without auxiliary mechanism. 169 tons.

   b) without water and oil .... 177 tons.

   c) complete for delivery (with all auxiliary equipment, spare parts and tools)............. 189 tons.

8) Overall measurements (without control stand):

   a) length . . . . 13471 mm

   b) breadth . . . . 5930 mm

   c) height . . . . 4048 mm.

B. Diesel Motor 8 DR 43/61.

1) Nominal output (duration performance without time limit) 2000 HP

2) Revolutions for nominal load . . . . 250 revs/min.

3) Max. output (up to 1 hour). . . . . 2200 HP

4) Revs. for max. output . . . . 258 revs/min.

5) Number of cylinders 8

6) Cylinder bore . . . . 430 mm

7) Piston stroke . . . . 610 mm

8) Average piston speed . . . . 5.1 m/sec.

9) Average effective pressure for nominal output . . . . . . 5.1 kg/cm^2.

10) Compression (minimum) . . . . 36 kg/cm^2.

11) Spark pressure with nominal output . . . . 62 kg/cm^2.

12) Exhaust temperature with nominal output:

   a) behind the cylinder
      middle value . . . . 280°C
      max. value . . . . 285°C

   b) in the exhaust collecting pipe . . . . 310°C

13) Flushing air pressure with nominal output . . . . 0.2 kg/cm^2

14) Specific fuel consumption at nominal output (related to 10.000 WE/kg) . . . . max 180 g/PSch

15) Lubricant consumption (circulating oil and cylinder oil) . . . . SECRET . . . . max 10 kg/hour

[redacted] 25X1

16) Minimum pressure to start the engine when warm . . . 12 kg/cm^2

17) Oscillating moment of the engine with the primary part of the hydraulic clutch . . . . . . 9352 kgm^2

18) Coefficient of irregularity of the engine (with primary part of the hydraulic clutch) 1/276

19) Free force of the rotating masses . . . . 0 kg.

20) Free moment of the rotating masses . . . . 2980 mkg

21) Free force, first order of the oscillating masses . 0 kg.

22) Free moment, first order of the oscillating masses . 9117 kg.

23) Free force, 2nd order of the oscillating masses . . 0 kg.

24) Free moment, 2nd order of the oscillating masses . . 10617 kg.

25) Weight of the engine: (without iron foundation and auxiliary mechanism):

   a) less filling . . . . 62 tons

   b) with water and oil . . . . 64.2 tons.

26) Weight of the heaviest part (cylinder block with inset bushes) . . . . 11 tons.

27) Main dimensions of the engine:

   a) length . . . . 9471 mm

   b) height . . . . 3638 mm

   c) breadth . . . . 2330 mm

C. Hydraulic Gear Drive 2G3-222.

1) Active diameter of the hydraulic clutch. . . . . . . 2220 mm

2) Slipping of the hydraulic clutch 3%

3) Pitch circle diameter of the pinion . . . . 789.816 mm

4) Pitch circle diameter of the large gear . . . . . . 2300.166 mm

5) Gear ratio in the gears. 1/2.91

6) Permissable propellor stress . . . . 60 tons.

7) Total efficiency of the gears 95%

8) Weight:

   a) less filling . . . . 45 tons.

   b) oil for the hydraulic clutches . . . . 3.6 tons.

9) Main dimensions:

   a) length measured over the flanges . . . 4000 mm.

   b) breadth . . . . 5930 mm.

   c) height . . . . 3435 mm.

Short description of the Diesel driven generator.

1. Engine 8 DR 43/61.

This engine is an upright, reversible, two stroke, plunge cylinder engine with direct injection.

The generator contains 2 engines: one of left design, the other of right design - both rotating to the left for movement 'ahead'.

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The cast iron housing for the engine consists of the base plate, the crankcase, and the cylinder block. They are connected by draw bolts.

The base plate consists of 2 pieces screwed together. The main bearing cups of steel are covered with white metal. The crankcase consists of 3 parts that are screwed together, and the cylinder block of 2 parts.

The case bushes of the working cylinders are made of cast iron. Each cylinder has its own cylinderhead. This is fastened in position with the help of a stud bolt that is screwed into the block.

The following are housed in the cylinder head: - an injection valve, a starter valve, a regulating valve for cool water and an indicator cock with safety (signal) valve.

The forged crank-shaft, of steel, is two-piece.

The piston rods of the working cylinder consist of a steel shaft, a screwed-on bolt (in the upper part) and a screwed-on lower head, the halves of which are bushed with whitemetal. The piston of the working-cylinder is of cast iron and consists of three main sections: the piston upper-section, the guide, and the special liner for absorbing combustion impact and for easing piston guiding. In the liner, is the piston pin-bearing brass, bushed with white metal. The covers of the piston-pin bearings are also bushed with white metal. In the upper part of the piston are packing-rings (piston-rings) and in the lower part of the piston-guide oil retainer rings. The piston is oil cooled, the oil being fed and withdrawn through telescopic cooling-pipes.

The two-piece cam-shaft runs in bearing brass with white metal bushing. It is driven by the crankshaft over spur-gears.

The single injector pumps for each cylinder are in pairs, fitted to the cylinder casing. The symmetry of the cam discs ensures the operation of the injector pumps during headway as well as sternway running of the vessel. The injector valve (with closed nozzle) is fuel-cooled, the requisite fuel - including also that for cooling the injector pumps - being fed - in by a gear-wheel pump operated from the cam-shaft.

Each engine is equipped on the outside with a fuel-filter. Engine starting and reversing is normally effected from the control stand. Engines are additionally equipped with control platforms in case of damage. Compressed air with a maximum pressure of 30 kg/cm^2 serves to start the engine. There is an interlocking arrangement in the starting system which prevents starting when the shaft-turning gear or propeller-shaft is operating.

The speed-governor accommodated at the rear of the engine is an independent unit with own hydraulic system. The governor ensures:

a) Infinite variability in number of revolutions from 90-238 Revs/min.

b) Stable engine-running within the entire range of revolutions.

c) Alteration of the degree of irregularity in the range of 4-6% when underway.

Lubricating oil is fed to the engine through an independent spindle oil pump with electric drive, for lubricating the main bearing, the cam-shaft bearing, etc., as well as for piston cooling. Each engine is provided with an oil-filter and a cooler, for use on the outside of the Diesel. The lubrication of the working cylinders is effected by means of special H.D.-lubrication apparatuses; these are set out at the starboard side of the engine, by the crank-case.

Seawater, fed to the engine by a special rotary pump with electric drive, serves for cooling. The pump supplies both engines, and the toothed gearing, with cooling-water. The rotary scavenge pump (blower system ROOTS) is at the side of the engine facing the flywheel, and is driven by the crank-shaft with the help of a resilient coupling. The engine is equipped with a rocking-motion-damper.

[redacted]

2. Toothed gearing with hydraulic clutches - 2 G3-222.

The toothed gear consists of two hydraulic clutches, a double toothed wheel reducing gear, and the main thrust-block of the screw-shaft - all in one casing.

The casing of the gears consists of a cast-iron frame and two welded chambers. The hydraulic clutches and the appliances for the turning of the screw-shaft and the engine crank-shafts are in the front section of the casing, the reducing-gear and the main thrust-block of the screw-shaft being in the rear section. The lower section of the casing is without a trough: it is set up directly on the base of the ship, taking into consideration the density of the oil. Each hydraulic clutch connects the crank-shaft of an engine with the pinion of the reducing-gear; it consists of the pump-rotor, the turbine rotor and a bearing brass with valve-ring to open the emptying outlets of the clutch. The shell and both rotors are welded.

The reduction gear has two driving-pinions and a driving wheel with helical (spiral) gearing. The driving-pinions are in the form of steel gear-rims and are in each case flanged together with two shaft ends.

The driving wheel is a steel spur ring pressed on to the cast iron hub and secured by means of threaded studs. The hub is fastened to the shaft by a taper connection (Konusverbindung) with threaded ring and a wedge.

The driving shafts of the clutches and the rear-ends of the pinion-shafts are led axially through Mitchell thrust-blocks (or single plate thrust bearings); the front ends of the pinion shafts run in plummer-blocks (journal bearings). The bearing brasses and sliding parts of the bearings are of steel with white metal bushing. The main thrust-block for the screw-shaft serves also as guide-bearing for the driving-shaft of the gearing. The control-gear for the hydraulic clutches (Servo-engines, filling valves, fixing contrivances, appliances for adjusting the valve rings) are found by the gear box and are compressed-air-operated from the central control-stand. Gearing and driving gear bearings are lubricated under pressure, by oil distributors accommodated at the sides of the gear casing. The hydraulic clutches are fed from an oil-pressure-container. Oil for lubricating the driving mechanism and the pressure container of the hydraulic clutches, is fed via filters and coolers through a special spindle-pump with electric motor.

3. Control-Stand of the Unit.

The control stand of the Diesel gear unit serves as the control for the engines and the toothed gearing (cogwheel gear). It ensures following operations:

a) Starting, stopping, speed control, and reversing of the engines (both engines together, or separately).

b) Control of each of the hydraulic clutches (engaging or disengaging).

c) Reversing the screw-shaft as follows:

i) by changing direction of rotation of the engines;

ii) by alternate engaging of the hydraulic clutches when the engines are running with differing directions of rotation.

The control stand is equipped with interlocking devices, which prevent the following reactions:

[redacted]

a) The starting of the engines with differing directions of rotation, when both clutches are engaged.

b) The connecting of the screw-shaft with both engines at the same time, when the latter are running in differing directions of rotation.

c) The engaging of the screw-shaft with the hydraulic clutch, the direction of rotation of which does not coincide with order received over the engineroom telegraph.

Speed control of the engines from the control-stand is mechanical with the aid of connecting wires between stand and engines. All remaining control is by means of compressed air.

The following are set out at the control point:

a) Master controls and pilot-wheels (hand-wheels).

b) Control measuring instruments (gauges).

c) A repeating installation for linking control with the hydraulic clutches and the control of the reversing valves with the scavenger blower.

d) Installation for giving warning of breakdowns (faults).

e) An electric engine-room telegraph.

PUBLICATIONS OF THE LENINGRAD TECHNICAL INSTITUTE FOR SHIP CONSTRUCTION.

The following volumes, of which a summary of the contents has in each case been translated, were handed to the Delegation in LENINGRAD.

The volumes are in the keeping of the Ministry for Heavy Machine Construction, Scientific-Technical Dept., Dept. No. III, who are prepared to undertake the translation of any particular work.

Volume 1 (1937).

Prof. P.F. PAPKOWITSCH.

A few general theories dealing with stability of resilient systems.

Prof. G.G. ROSTOWZEW.

On the question of the coefficients of reduction and the reduced width of compressed plates.

Prof. P.T. SOKOLOW and G.D. KOKOSCH.

An experimental study of the resilient after-effects of metals.

Prof. M.J. ZANOWSKI.

The transmission of heat from steam to the tubing of ships' condensers with air present.

Doz. W.J. KADYKOW.

On the subject of tangential strain in discs which rotate with variable angular velocity.

Aisst. J.W. WINOZRADOW.

On the room capacity of passenger carrying freighters.

Stud. A.A. KURDYUMOW.

On the question of the calculation of decks which are propped by several intersecting supports.

Volume 2 (1938).

Dr. mer.techn. Prof G.E. PAWLENKO.

The problem of extremely fast ships.

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Aspirant W.P. BELKIN.

On the calculation of intersecting supports (propping).

Aspirant W.P. BELKIN.

Tables and graphs (diagrams) for the calculation (computation) of uncut plates which curve (bend) in accordance with a cylinder surface.

D.B. SKOBOW.

On the stability of thin-walled, rectangular pillars.

Doz. A.W. GOLYNSKI.

Methods for the compilation of the characteristic value of triple cut-off valve machines.

Doz. N.A. SABOTKIN.

Open 'Framtanks' (sic).

Dr. rec.techn. Prof. N.N. WESKRESENSKI.

Examination of riveting materials.

Prof. W.P. WOLOGDIN.

Apparatus for defining the utilization coefficient of a welding machine.

Ing. K.M. OLIFIRENKO.

Installation for visual research into electric-arc welding and for screen demonstration.

Aspirant S.W. LAINER.

Methods of determining the necessary pressing capacity for ship construction work.

Ing. K.W. DORMIDONTOW.

The slipway labour plan and its effect on the distribution of hull workers, from keel laying to launching.

Ing. A.B. GALSTJAN.

Research into the methodology employed in examining the effects of wear and tear on grey cast iron in ships piston engines and internal combustion engines.

Volume 3 (1939).

Prof. J.N. WOSKRESSENSKI.

Welded seam corrosion in sea water.

Doz. K.F. KOSSENROW.

Computation of gliding boats.

Ing. P.F. MIKLUCHIN.

On the question of determining strain on level parts by optical methods.

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Doz. A.J. STETZKI.

Conversion formulas for propellor pumps.

[redacted]

Assist. G.D. KOKOSCH.

Experimental research into the resilient hysterisis loop of metals.

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Ing. M.D. ZANKELEWITSCH.

On the question of determining the period of the exhaust and scavenging of the two-stroke engine.

Ing. W.P. KONTENKO.

The problem of the speed limit of ships whilst moving on the water surface.

Volume 4 (1939).

Dr. rer.techn. Prof. G.E. PAWLENKO.

Points on the most advantageous form of movement of ships in currents.

Dr. rer.techn. Prof. G.E. PAWLENKO.

Resistance, dimensions and angle of inclination of slide-faces.

Prof. K.S. KOSSONROW.

On the stability of diving bell type docks.

Aspirant G.A. REWSJUK.

New methods for testing the water-tightness of ships' hulls.

Prof. W.L. SURWILLO.

The theory of vane-type pumps with eccentric displacement bodies (Verdraengungskoerper), according to GALARATESI.

Ing. P.F. MIKLNCHIN.

The determining of strain from test-data.

Ing. P.F. MIKLNCHIN.

On the question of the building up of a stress factor from test-data.

Doz. A.W. GOLYNSKI.

Method of calculation for multiple-expansion engines according to the individual cylinders and in accordance with the "i-s-Diagram".

Doz. A.W. GOLYNSKI.

Combined Plant - system "Johansson-Gotawerken".

Ing. K.M. OLIFIRENKO.

The employment of the magnetic flaw tester in the examination of welded seams.

Doz. W.D. WERSCHBITZKI.

Dealing with a number of points on the subject of gear box construction.

Stud. W.A. NIKOLAJEW.

"Velox" Installations.

Volume 8 (1951).

A.A. KURDJENKOW.

The employment of the method of 'Continuous Approximation' in order to ascertain the form and frequency of the free rolling of a ship, taking the displacement into account.

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L.M. NOGID.

Utilization of the cubical contents equation in the planning of freighters for dry cargo.

A.M. PROTASSOW.

Standard representation of a square with rounded corners on a "half-surface" (Halbfläche).

W.A. BYKOW.

Grease structure for launching purposes.

N.L. SIEVERS.

Analytic examination of the 'Information' of a deck house.

J.J. KOROTKIN.

Stability of the even curvature of bulkhead stiffening.

W.F. MECHUNAS.

Concerning the dynamic calculation of buoyancy in the raising of ships.

S.N. BLAJOWESCHTSCHENSKI.

Concerning the works of I.G. BUBNOW on 'The Theory of the Ship'.

G.F. KAMNEW.

The life and erudition of the worthy Professor F.A. BRIKS.

W.G. PLOTIZYN.

The first lathes.

Volume 9 (1951).

N.A. SABOTKIN.

An icebreaker's impact with the ice-field and its mounting of the ice floe.

W.W. LEMONOW-TJANSCHRANSKI.

The effect of the vertical motion of a ship on the initial transverse stability.

L.M. NOGID.

On the stability standards of tramp steamers.

J.J. KOROTKIN.

The effect of methods of fixing on the stability of the even curvature of bulkhead stiffening.

A.S. LOKSCHIN.

The testing of strain concentration in a plate weakened by the cutting out of two round pieces.

W.W. NAUMOW.

Improved graphic-analytic calculation methods for turbine casing flanges.

F.J. IWANOW.

The theory of wheel-gearing of a slewing crane with hinge-joint crane-jib; (this refers to a lemniscate crane).

A.B. GALSTJAN.

Modern methods of obtaining castings in machine construction.

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A.N. KRYLOW 1863-1945 (University student).

P.A. DOROSCHENKO.

The Life and Learning of Professor J.N. WASKRESSENSKI.

G.A. BELTSCHECK.

The history of the development of electrical welding in Soviet shipbuilding.

W.J. KOSLOW.

The story of the ship's steam engine, and the part played by Russian scholars in its invention and development.

Volume 10 (1951).

W.P. WORONKOWSKI, P.A. ISTOMIN and M.M. FUKI.

W.A. WAASCHEIDT, Stalin Prize Holder.

W.A. DELLE.

Obituary of N.A. SCHAFCECHNIKOW.

A.A. KUDSJUMOW.

An index of the works of P.F. PAPKOWITSCH, with commentaries.

A.A. KUDRJUMOW.

Determination of keel-block reaction on the docking of a vessel in a floating dock.

W.W. SOMENOW-TJANSCHANZKI.

Non-linear (rolling) motion of a ship in calm water, by a resistance proportionate to the square of its speed.

W.A. BYKOW.

The introduction of a grease produced from naphta derivatives, for the launching of ships.

W.F. POPOW, A.G. ROCHLIN and G.J. BARIT.

Economy in the work of adjustment in the preparation of ships foundations.

N.A. SCHAPOSCHNIKOW and M.J. SCHASCHIN.

On two factors of the fatigue process.

N.A. SCHAPOSCHNIKOW.

The effects of surface finish on fatigue and notched bar impact strength of the metal.

W.A. DELLE and P.W. PLISOW.

Breaking stress of constructional steel and of mild steel (shipbuilding steel).

A.G. KURSON.

On the theory of single stage regenerative feed water heating.

F.L. JUDITZKI.

The calculation of slide-valve steam distribution and of propulsion with cam shaft.

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On dynamic occurences in the exhaust pipes of two-stroke engines.

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A.B. GALSTJAN.

Rolling (milling) and cementing of armour plates - a Russian invention.

S.A. KAPLAN.

The conversion to a Riccati-equation, of a non-uniform (inhomogen) linear differential equation of the second order with variable coefficients.

Volume 11 (1953).

J.I. WOITUMSKI.

Particulars of the resistance of ships in the sphere of critical speed.

K.K. FEDJAJEWSKI.

Does a ship require dynamic stability on a straight course.

K.K. FEDJAJEWSKI.

On the loss of speed of a surface vessel in the stabilised turning circle.

G.D. MOSCHKOW.

The calculation of the bend of a bottom, viewed as a complicated plate (komplizierte Platte) of variable rigidity (reference here is to a double bottom).

A.A. KURDJAMOW.

The stability of even decks, reinforced with girders.

W.E. SCHUKOW.

Stress and strain in a plate, with abrupt change in width.

W.A. BYKOW.

The effects of cold working on the tendency to brittleness of constructional steel plating.

E.S. REINBERG.

The testing in a corrosive agent, of the stability of constructional steel.

W.J. KOSLOW.

S.O. BURATSCHOK - an outstanding Russian shipbuilder.

L.J. TABATSCHNIKOW.

On the question of the selection of an "equivalent" blind screen.

W.G. RABINOWITSCH.

The calculation for spiral springs, taking into consideration the friction between contacting gears.

O.W. DUBROWSKI.

Equipment with resilient bodies.

O.W. DUBROWSKI.

CLAPEGRON and his book "On the Motive Power of Heat".

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I.S. KRIWENKO.

Geometry and contact strength of worm gearing.

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L.K. ALDERSTEIN, J.B. KAGANER, A.N. SCHEBALOW.

Calculation of the wave resistance of ships during movement in a channel of limited depth.

J.B. KAGANER.

Theoretic exploration of gliding.

N.J. PANTELEJEW.

Examination of the operation (Betrieb) of a main turbo-gears unit (Turbogetriebe Aggregat) when braking or on seizing of the screw (propeller) shaft.

Sch. S. SCHUSCHARIER.

The calculation (computation) of thin-walled vessels under external pressure.

W.J. BALAKIJA.

Analysis of precision work on cylinder liners in engines' cylinders.

Volume 12 (1954).

From the editorial course of lectures in the section:

The Theory and Planning (Designing) of Ships.

S.N. BLAJOWISCHTSCHENSKI.

On corrective coefficients for taking into account the influence of the transverse dimensions of a vessel, on its rolling motion.

J.I. WOITKUNSKI.

On the selection of the most favourable ratio in ships' dimensions and effective channel profile.

A.N. SCHEBALOW.

On the question of determining the coefficients of the excluded masses.

Section: The Constructional mechanics of the ship.

A.A. KURDJAMOW.

The stability of flat decks supported by stanchions.

W.A. BYKOW.

Plane tension resistance of steel used in shipbuilding.

Sch. S. LOKSCHIN.

Investigations into stress/strain and deformation in beams consisting of rectangular strips (Streifen), on the building up of welding beads.

N.L. MOSCHENSKI.

Dynamic deadweight carrying capacity on girders buckling under strain.

I.J. JUCHIMUK.

Stability of decks reinforced by cut ribs.

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Section: Hull construction, Welding and Shipbuilding Technology.

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A.J. PAWLOW.

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G.A. BELTSDONK.

Scientific research work of the Professorial Chair for Ship designing, in the field of welding utilization in ship construction.

W.K. DORMODONTOW.

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Section: Ships' engines, Boiler and Installations.

M.Sch. SCHIFRIN.

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F.L. JUDITZKI.

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Section: Internal Combustion Engines for Ships.

W.A. WANSCHEIDT.

Particulars of the working of two-stroke ships' motors with blowers.

M.M. FUKI.

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Section: Ships' Turbines and Installations.

A.G. KURSON.

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W.A. DMITRJEW.

General principles on the computation of the strength (resistance) of component parts of machinery, without utilization of the concept "limiting pressure (voltage)".

W.P. SUSLOW.

On determining the critical number of revolutions of a ship's propeller shaft installation..

Section: The Technology of the Construction of Ships' Engines.

A.G. ROCHLIN.

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A.S. KREPS.

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W.W. BORCHERT.

Production capacity and the utilization of basic resources in shipbuilding.

B.W. IWANOW.

The mechanisation of statistics in shipbuilding.

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J.I. WOITKUNSKI.

The calculation of the resistance coefficients and the corresponding moments of inertia during the rolling motion of a ship, from data obtained in trials with the model.

A.A. KURDJAMOW.

Oscillation (vibration) of plane cantilevered decks, supported on two gunwales.

L.M. NOGID.

On resonance of the rolling and pitching motions of the ship.

M.N. REINOW.

Profile drag of bodies with relatively large length expansion.

W.W. SEMONOW-TJANSCHANSKI.

On the resistance of a semi-immersed body by non-stabilised movement.

W.W. SEMONOW-TJANSCHANSKI.

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A.N. SCHEBALOW.

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A.N. SCHEBALOW.

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W.A. BYKOW.

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I.I. MERATOW.

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W.D. TJUKIN.

The determining of friction caused to a ship's internal combustion engine, through the continuous cutting-out of the cylinders.

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Equations of the dynamics of steam boilers with natural flow.

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Concerning certain features of the elliptical diagram of steam distribution.

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W.D. SAEJALOW, R.W. SALOBEW.

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B.P. KUSOWENKOW.

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W.A. NIKITIN.

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G.N. TKATSCHUK.

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J.I. FADDAJEW.

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Volume 14 (1954).

A.A. MOISSJEW.

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K.P. BOKLEWSKIJ.

1862-1928. Material for the biography.

L.M. NOGID.

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K.K. FEDJAJEWSKI.

The computation of the hydrodynamic characteristics for ship's rudders by the employment of a theory, which takes into account the hydrodynamic characteristics of a short vane made up of a linear reverse flow component and a non-linear component of the passing current on the front and rear edge.

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P.A. APUCHTIN.

The influence on resistance to propulsion of the principal dimensions of inland vessels.

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A.W. BRONNIKOW.

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J.I. WOITKUNSKI, W.F. MEILUNAS.

An examination of the hydrodynamic characteristics of ships during athwart movement and in turning on vertical axis.

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P.A. ISTOMIN.

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W.K. NAUMOW.

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M.Sch. SCHIFRIN.

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G.W. SCHLENOW.

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W.A. POSTNOW.

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J.I. FADDEJEW.

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I.J. WOITKUNSKI, W.I. KOSLOW.

An outstanding scientist in the field of heating technique and the theory of the ship - I.P. ALYMOW.

W.A. BYKOW.

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The effects of increased load speed (Belastungsgeschwindigkeit) on the tendency of light constructional steel to break because of brittleness.

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M. MARKOWITSCH.

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L.A. SAMARKIN, W.A. TONKODUB, M.A. HASANOW.

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A.A. KURDJAMOW.

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J.I. KOROTKIN.

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Excessive plate bending in the special instance of a plate set unsymetrically in the centre.

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On conformity in generalizations in the plastic stability of shipbuilding steel.

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On the question of the change-over from steel CT 4 c to other types of steel in the construction of ocean going ships.

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K.K. FEDJAWESK.

Approximation method for theoretical determination of the results of hydrodynamic transverse (radial) force and of the off-course running of the angular velocity (velocity of rotation) for lengthy bodies.

P.A. APUCHTIN.

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A.N. KOLODIN.

The determination of the resistance coefficient against sea agitation by a ship (Sea agitation must be taken as referring to all movements performed by a ship in heavy seas).

A.N. KOLODILIN.

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A.G. ROCHLIN.

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P.A. ISTOMIN.

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The operation of a two-stage axial ventilator with counterturning rotation of the blades.

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A.P. ASZYKOW.

The selection of the most advantageous axial flow speed when calculating the step of an axial ventilator.

W.A. BYKOW.

Strain danger limit or dangerous strain conditions, of steel in machinery or in other metal constructions and the resistance conditions.

E.S. REINBERG.

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J.N. SAJAJIN.

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M.E. PODOLSKI.

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A.A. TROITZKI.

On the optimum number of regenerative stages of feedwater for power plant on merchant ships.

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J.I. KOROTKIN.

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N.L. SIEVERS.

An examination of the combined influence of the complete curvature of the ship's hull and the curvature of the floor transom on the support of the outside planking of the floor and the double bottom, in the curvature.

W.W. KOSLJAKOW.

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B.W. JATSDMRSCHINSKI.

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The practice of employing the provisional standard. "The testing for watertightness of the steel hull of ocean-going freighters. Methods and standards GOST 3285-46".

W.W. KOPEJETSKI.

On the differential coefficient of the formula for the thrust of a propeller in the theory of RANKIN-HOND.

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A.N. SCHEBALOW.

Approximate methods for determining the crucial point of pressure of hydrodynamic forces during athwart movement of a ship.

J.W. POPOW.

On the hydrodynamic moment, of bodies moving under the free surface of an 'ideal' liquid.

J.A. IWANOW.

Some questions on the theory of gyro-apparatuses for producing simulated rolling motion in ships' models.

W.K. GLOTOW.

Consideration of the non-rectilinearity of the ship's sides in calculating the cross-curves of stability.

W.K. GLOTOW.

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B.N. SCHATSCHKOW.

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O.A. KRUSE.

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W.I. BARANZEW.

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B. KOROWITSCHEW, N.O. PODOLSKI.

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G.A. BELTSCHUK, W.D. MATZKEWITSCH.

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K.M. OLIFIRNKE.

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F.F. BENUA, W.J. OSOLIN.

Research into the automatic arc welding of brass on to cast iron.

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Methodology in welding tuition, for students of the LENINGRAD Shipbuilding Institute.

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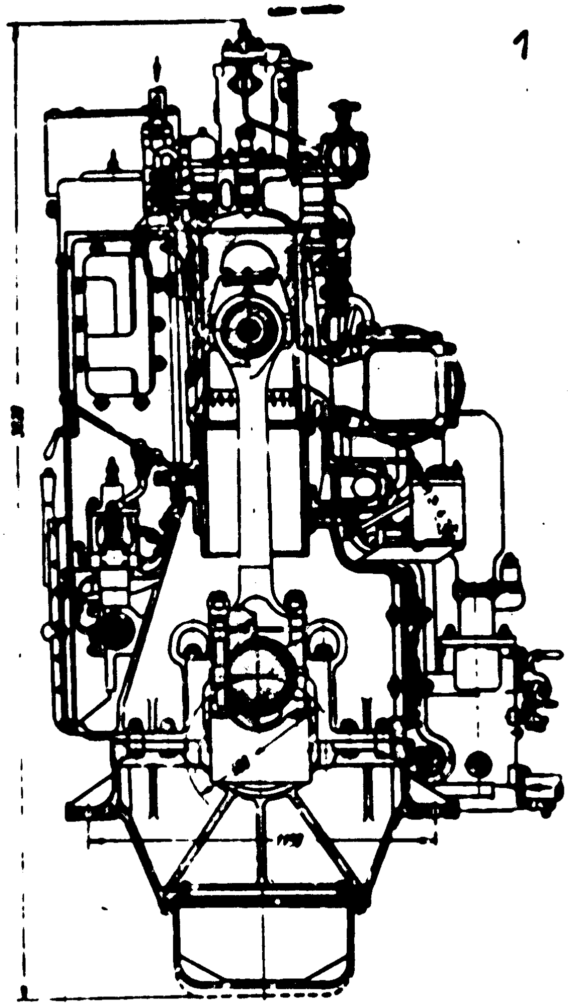

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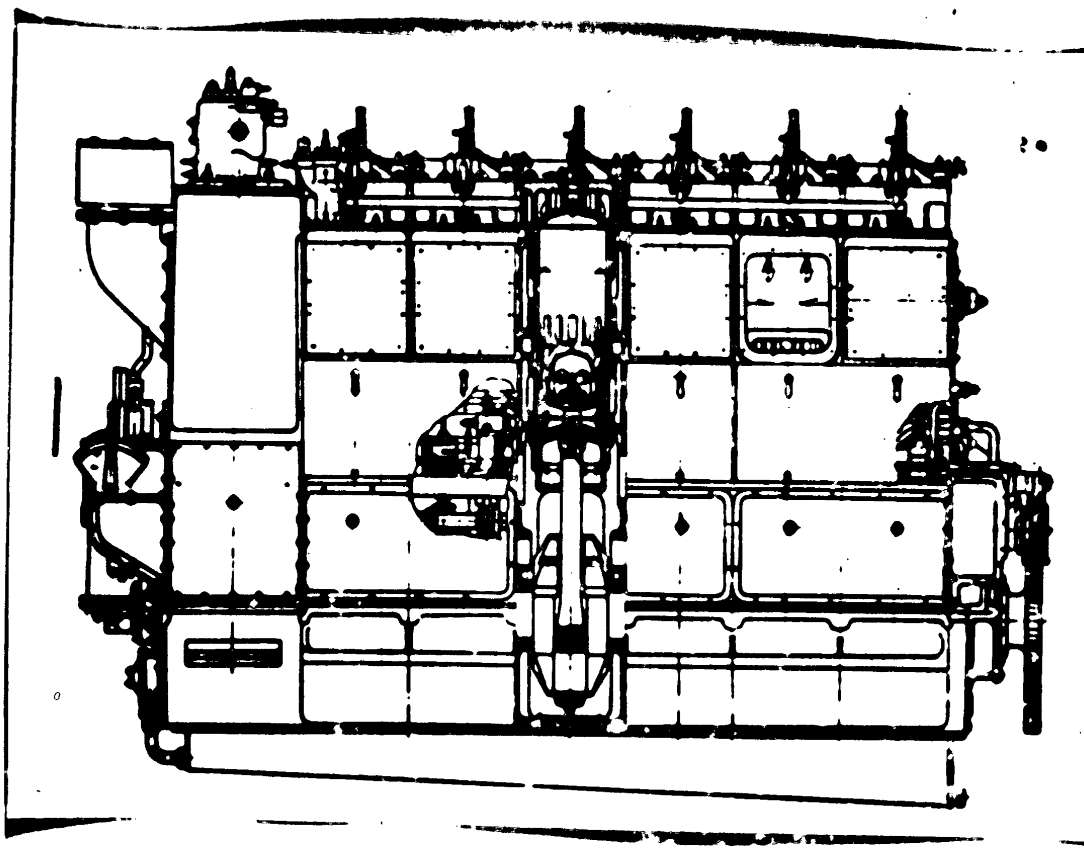

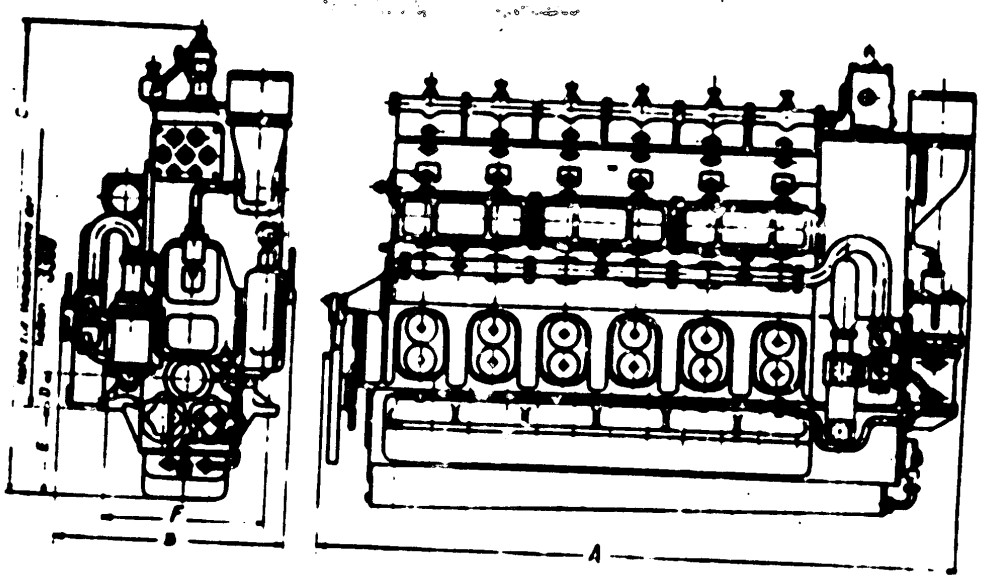
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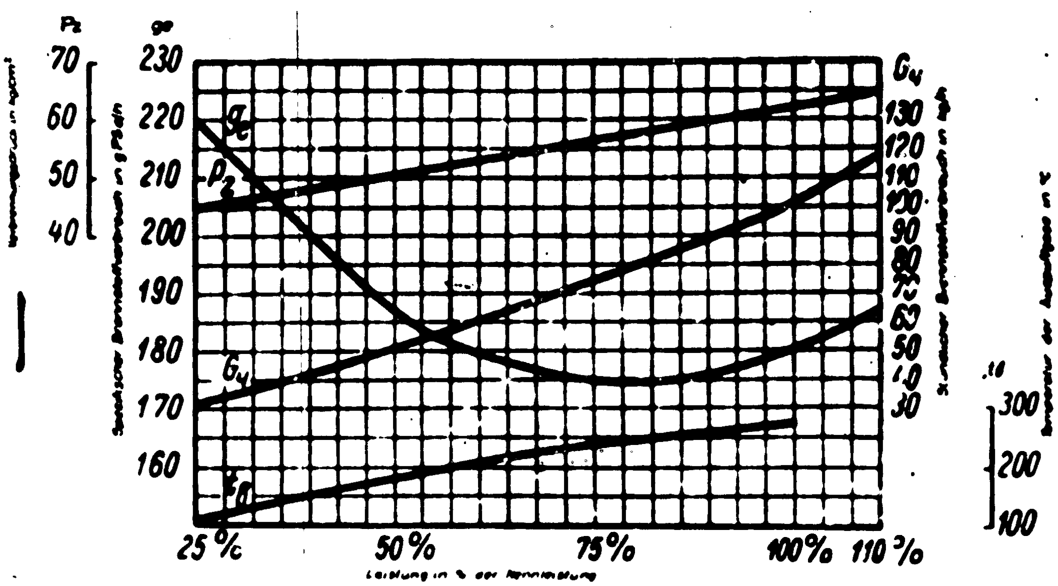

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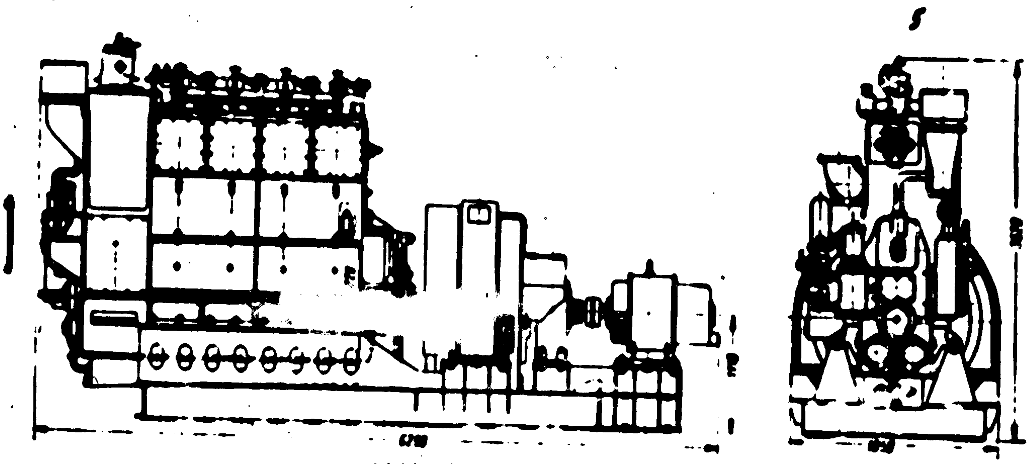

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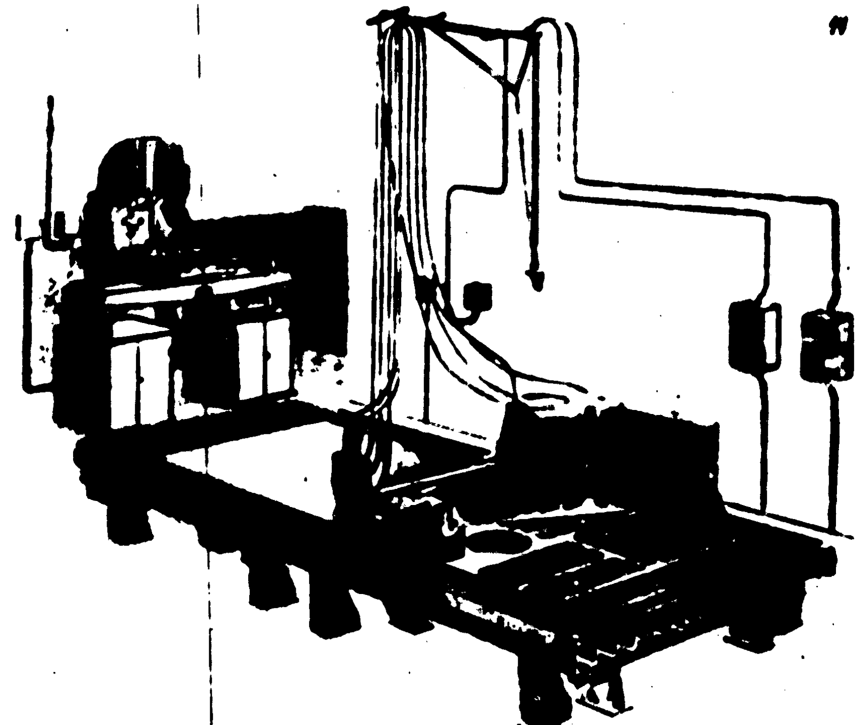

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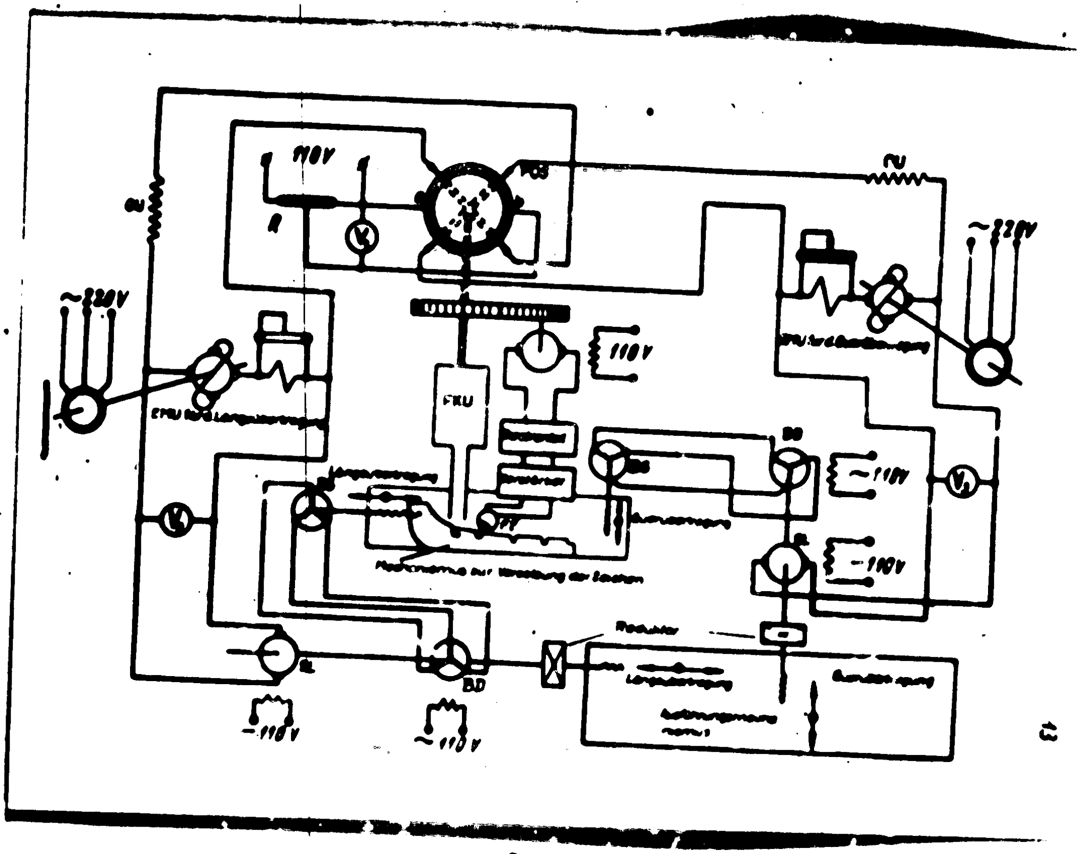

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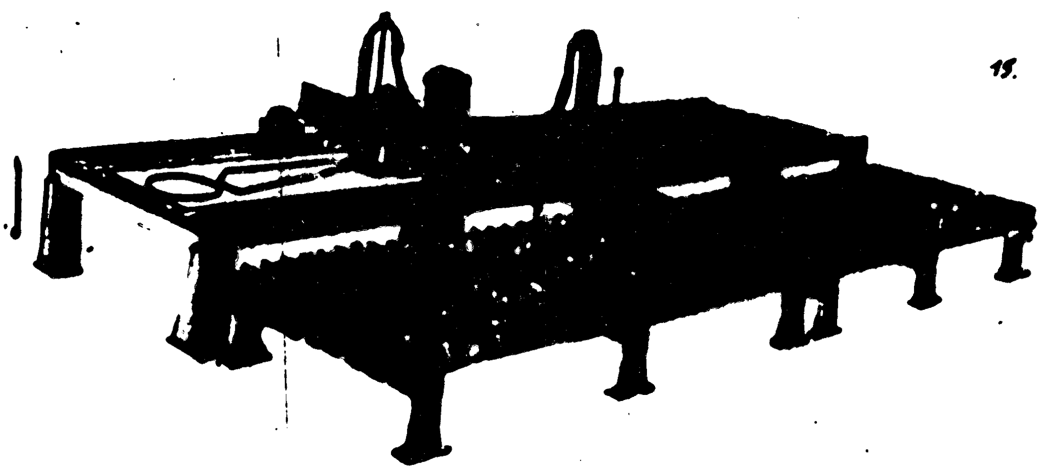

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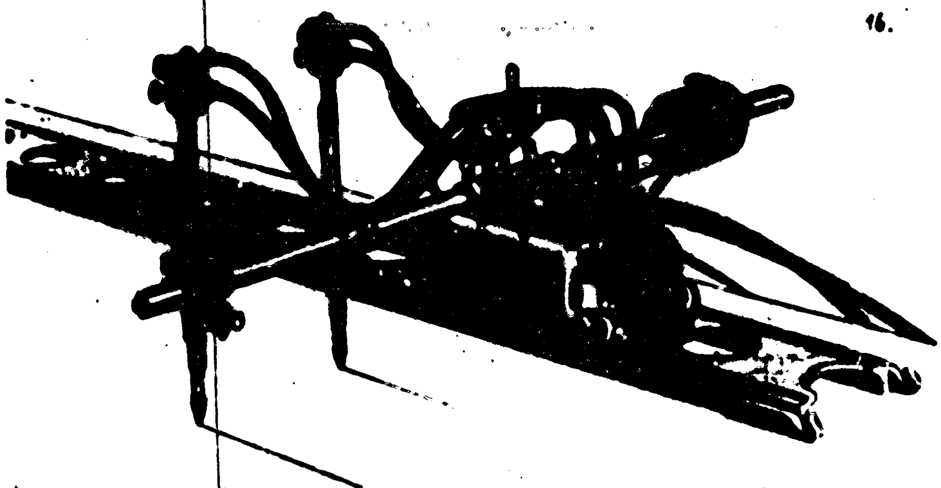

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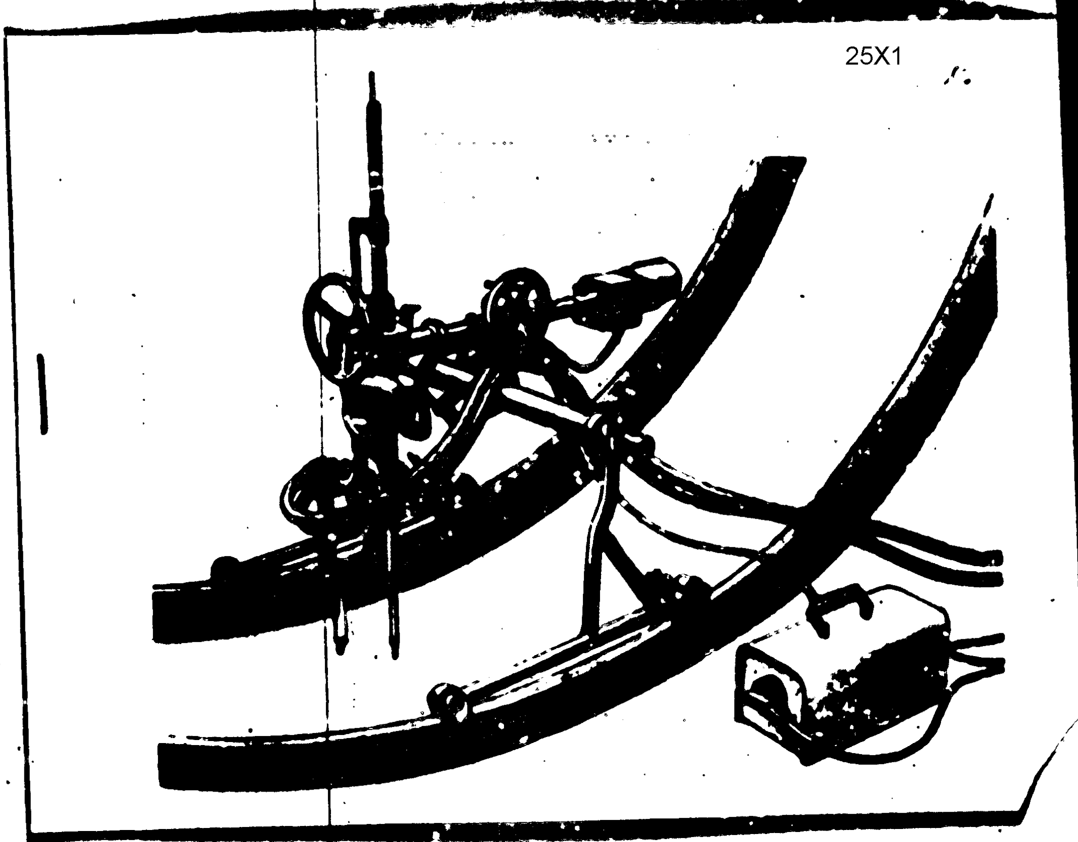

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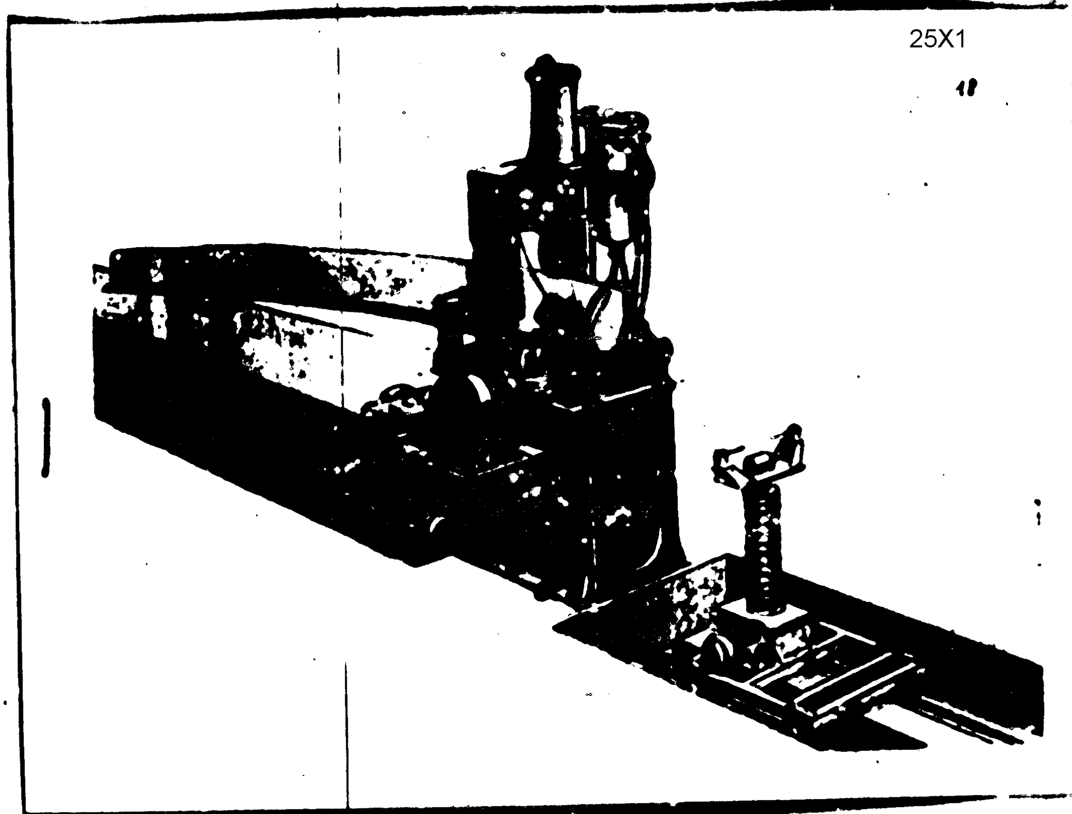

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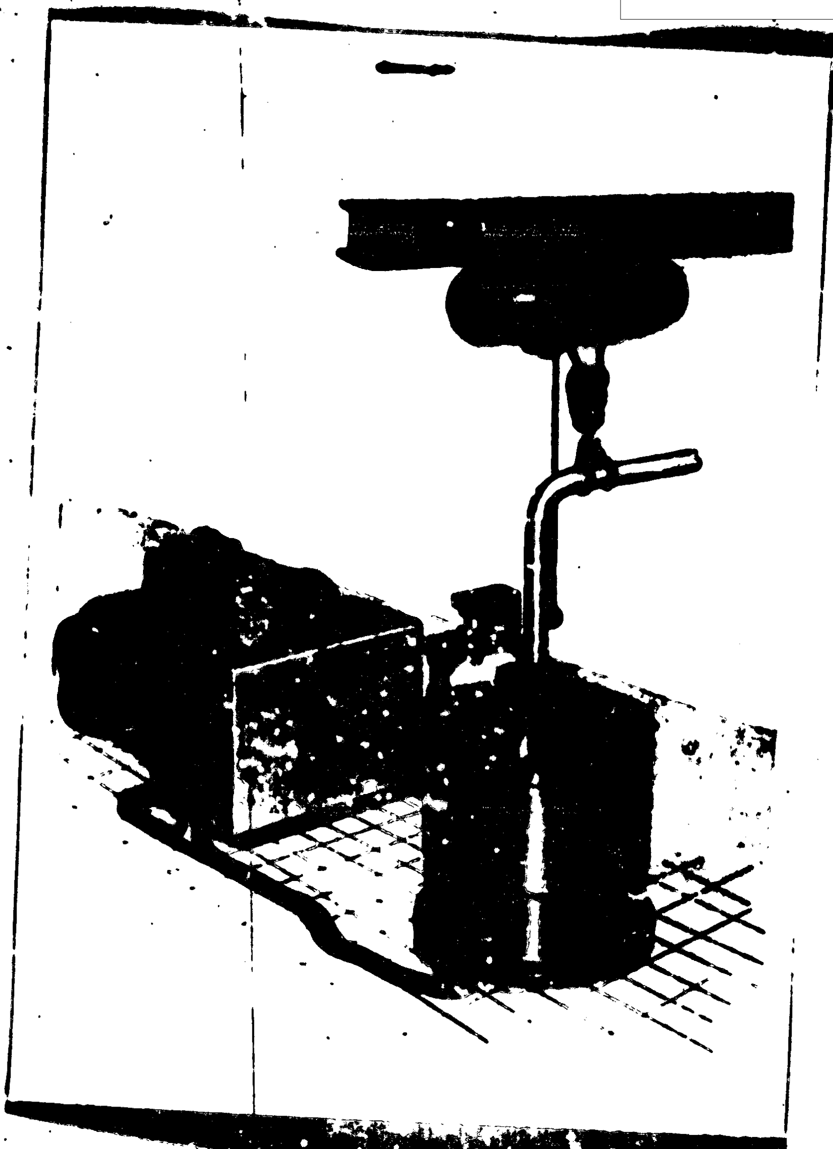

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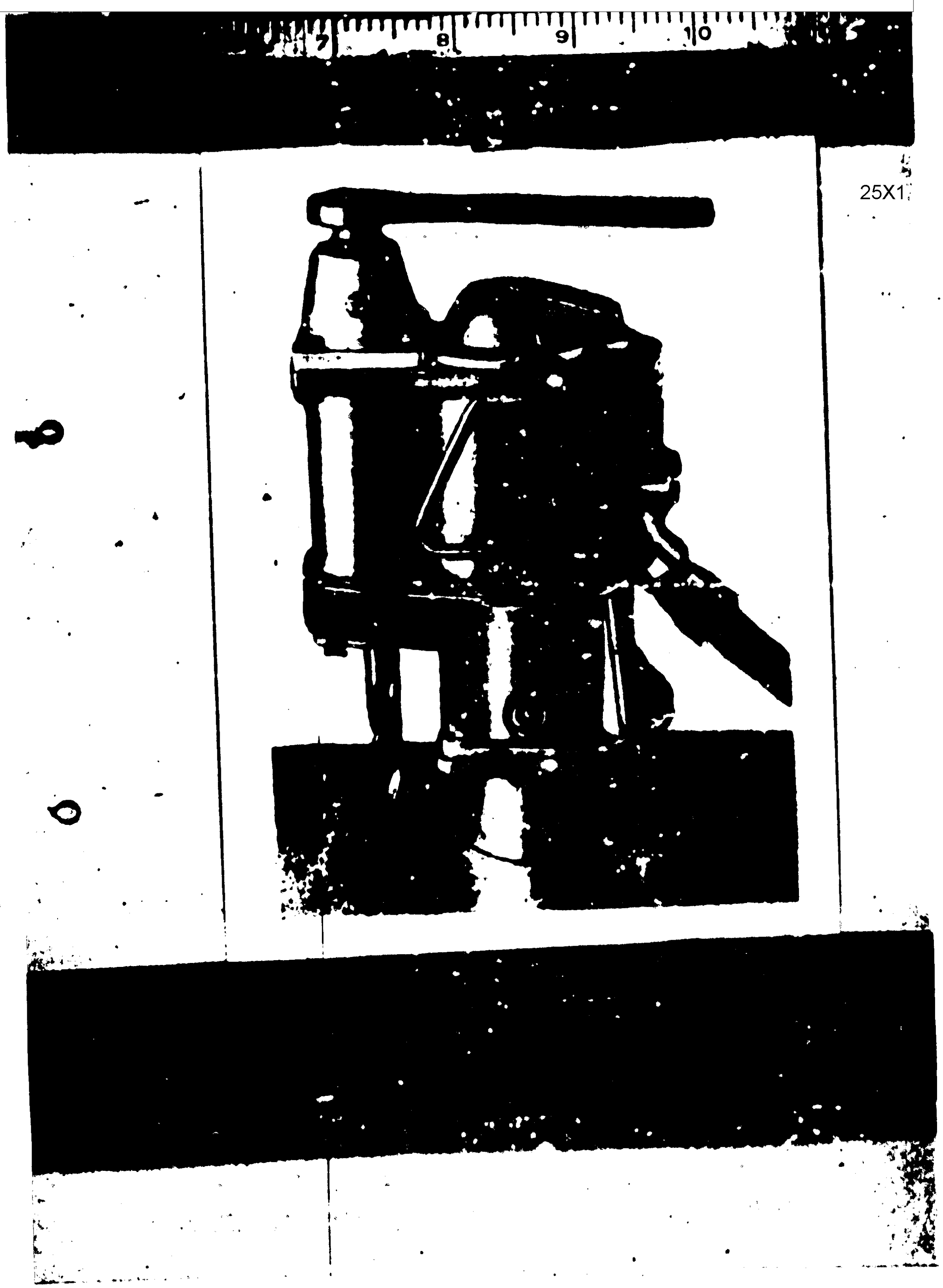

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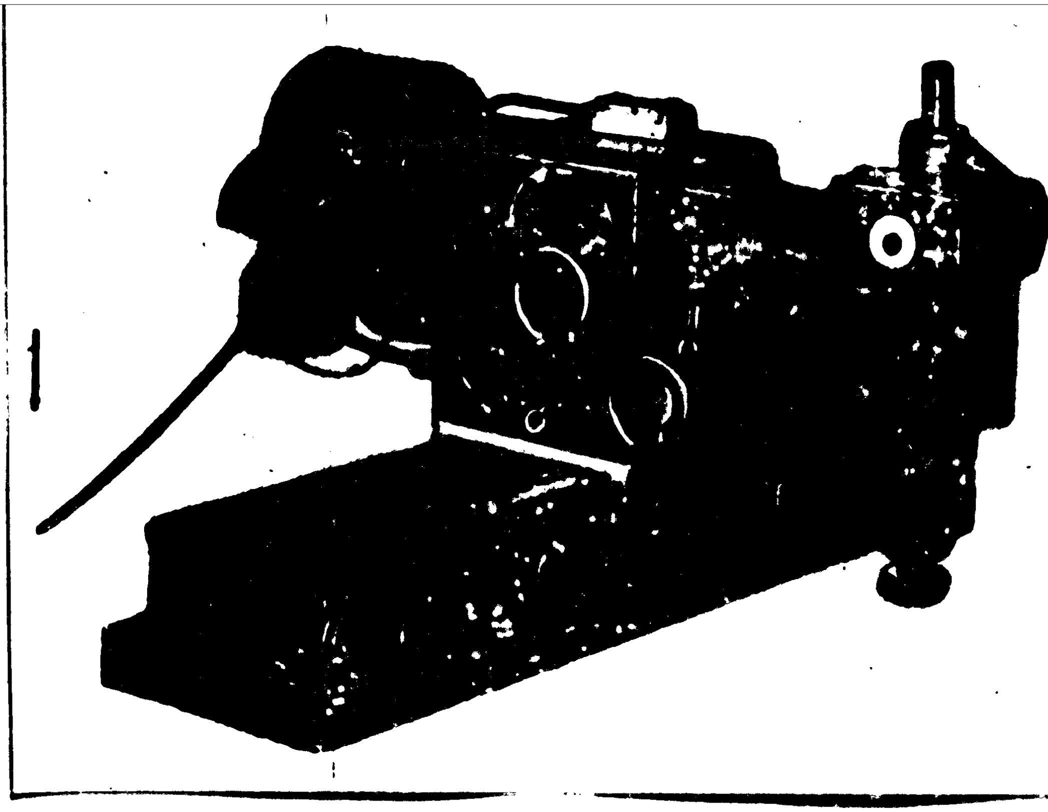

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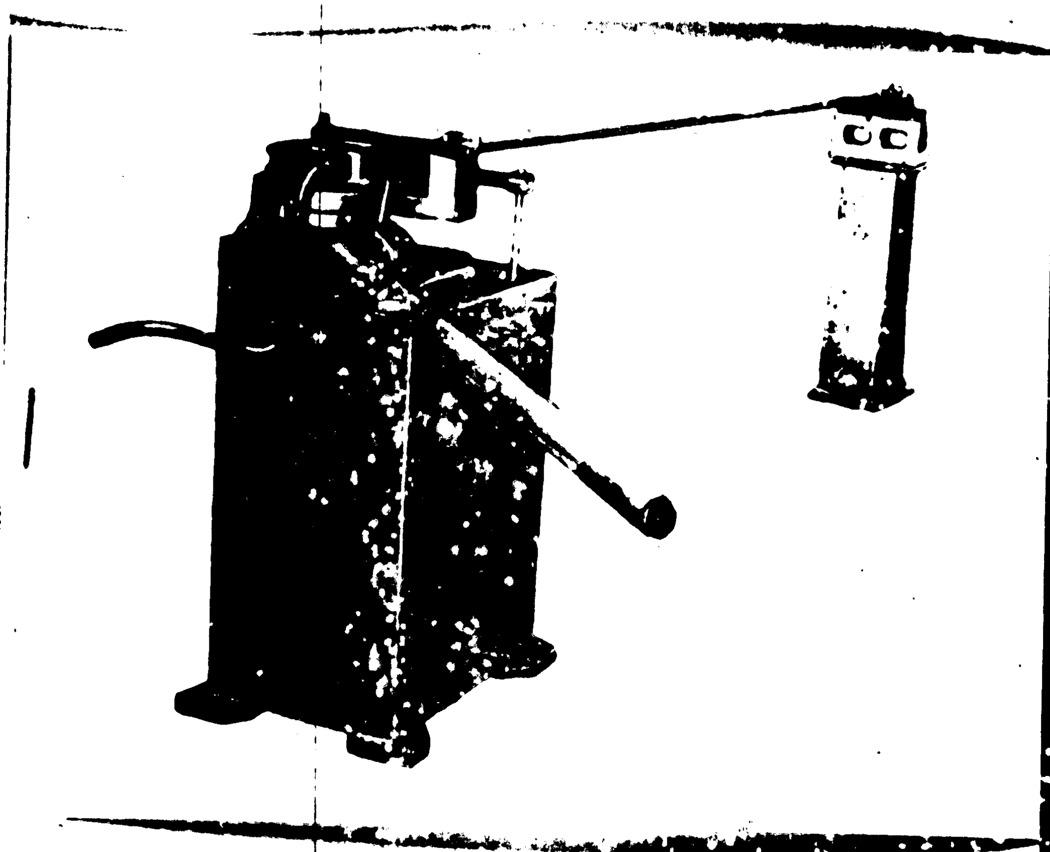

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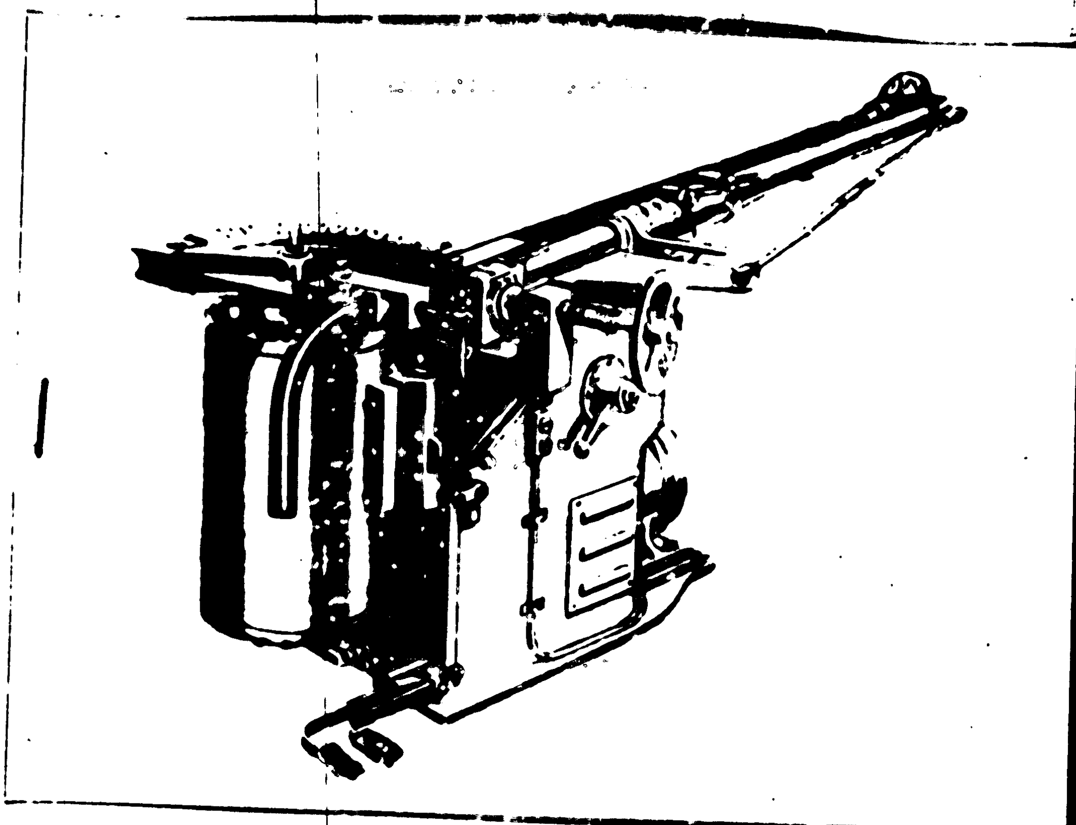

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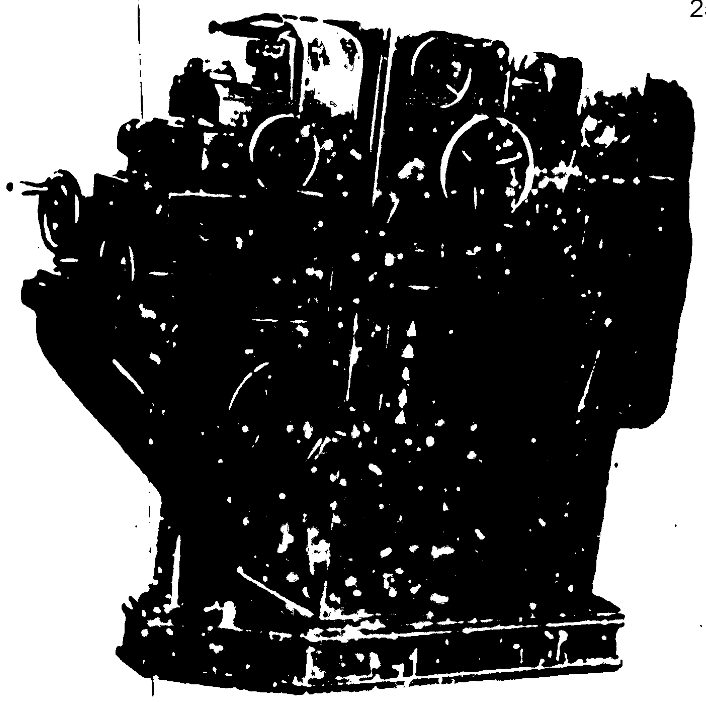

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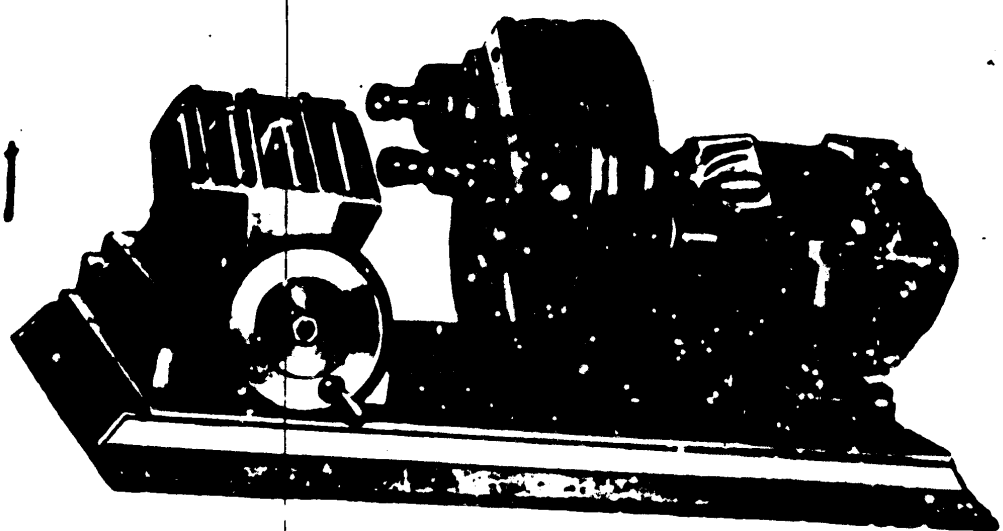

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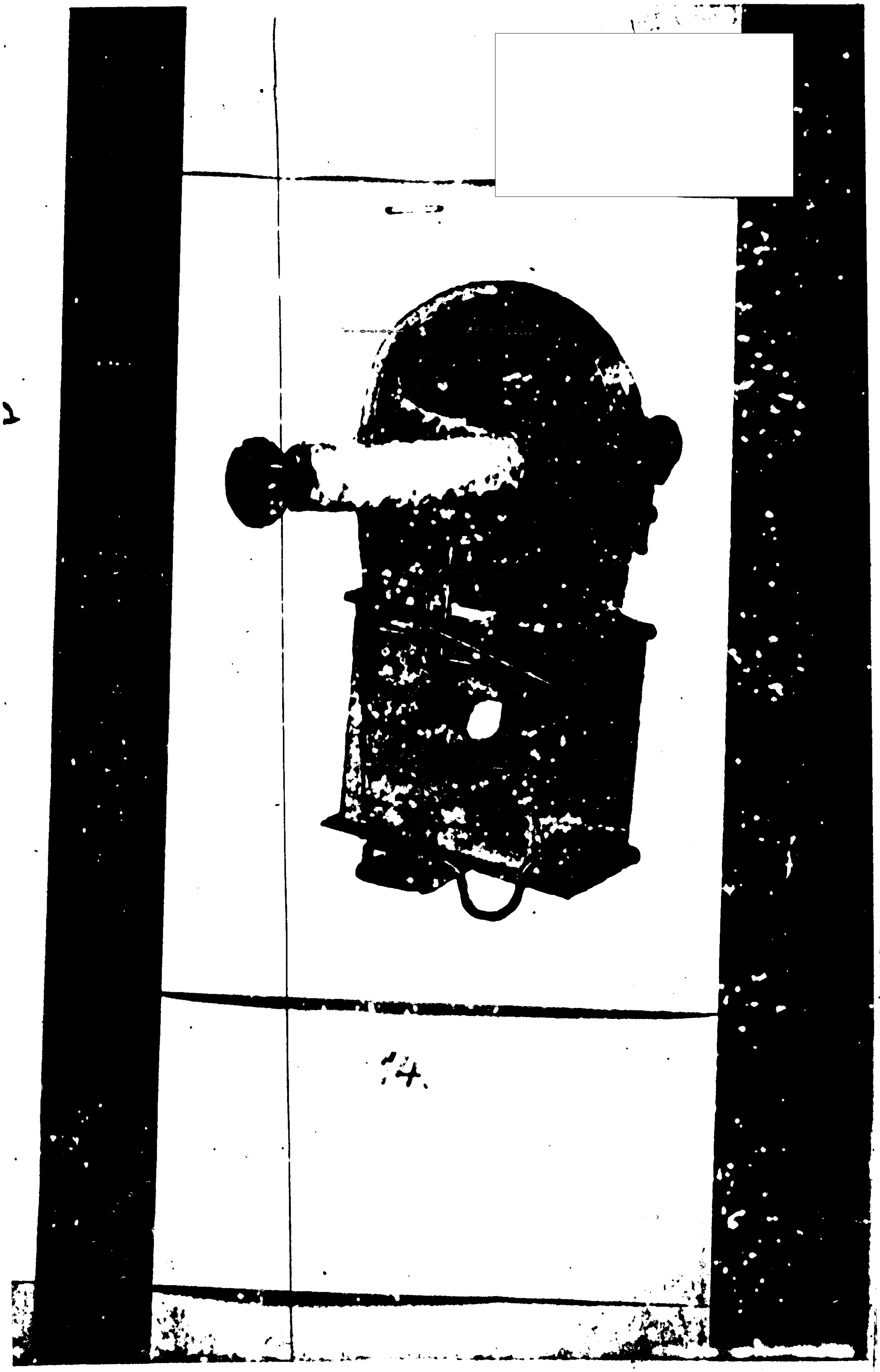

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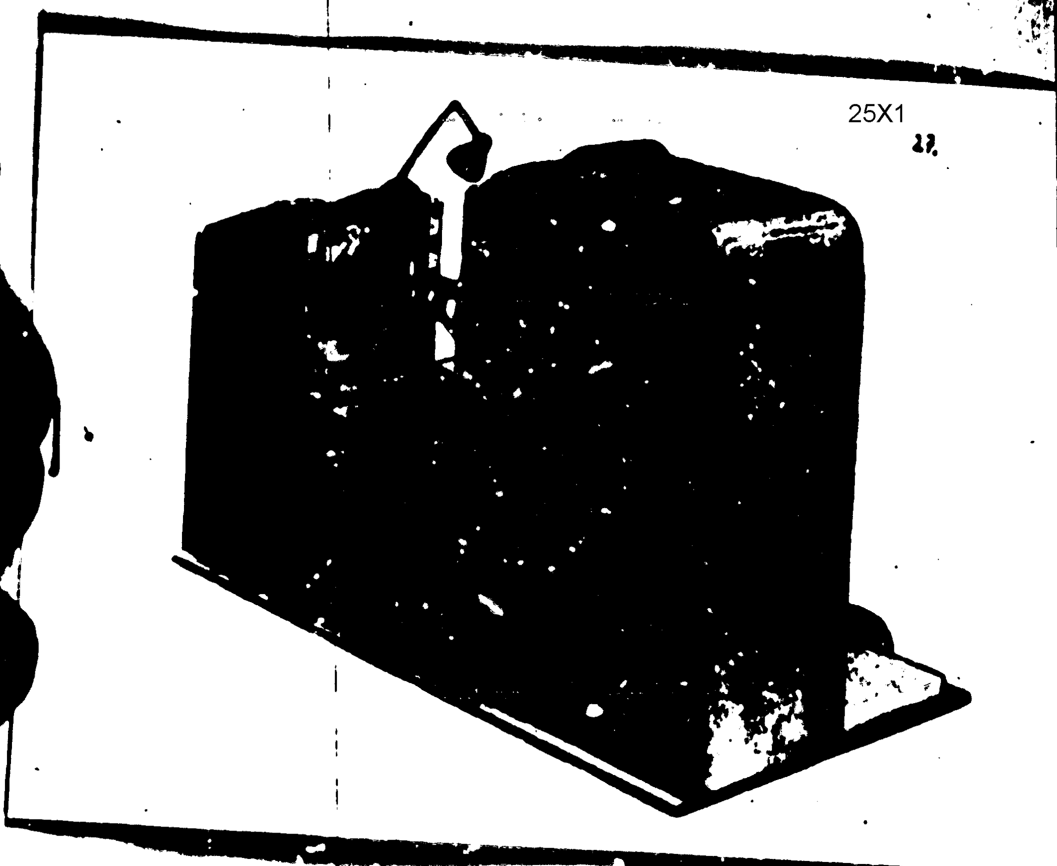

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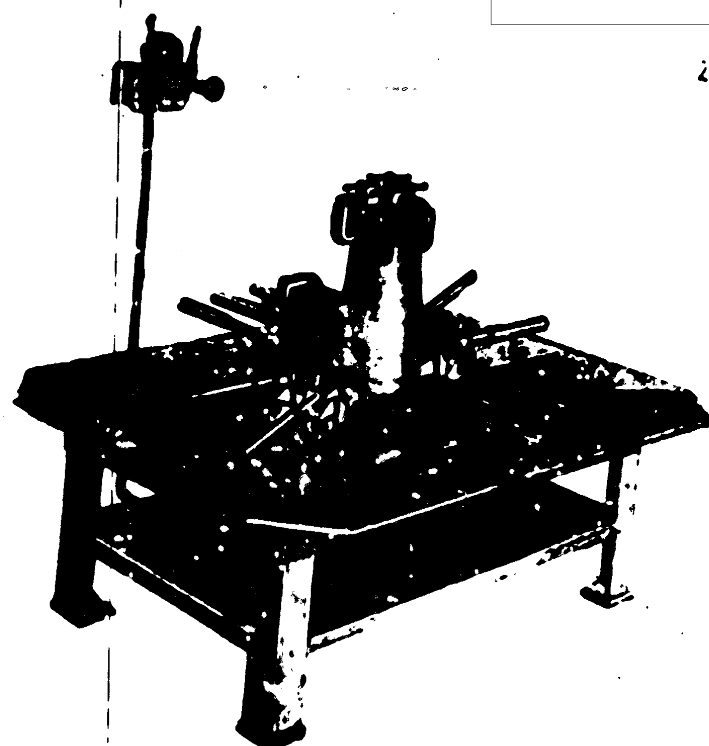

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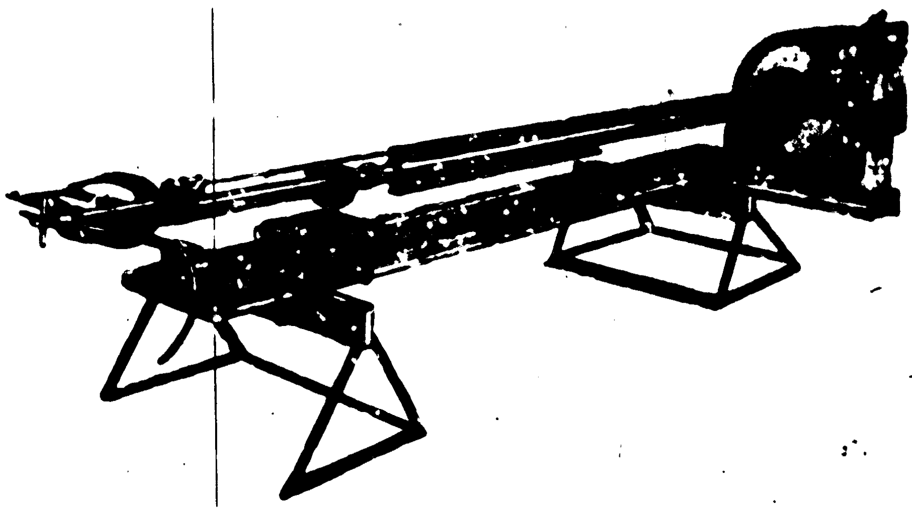

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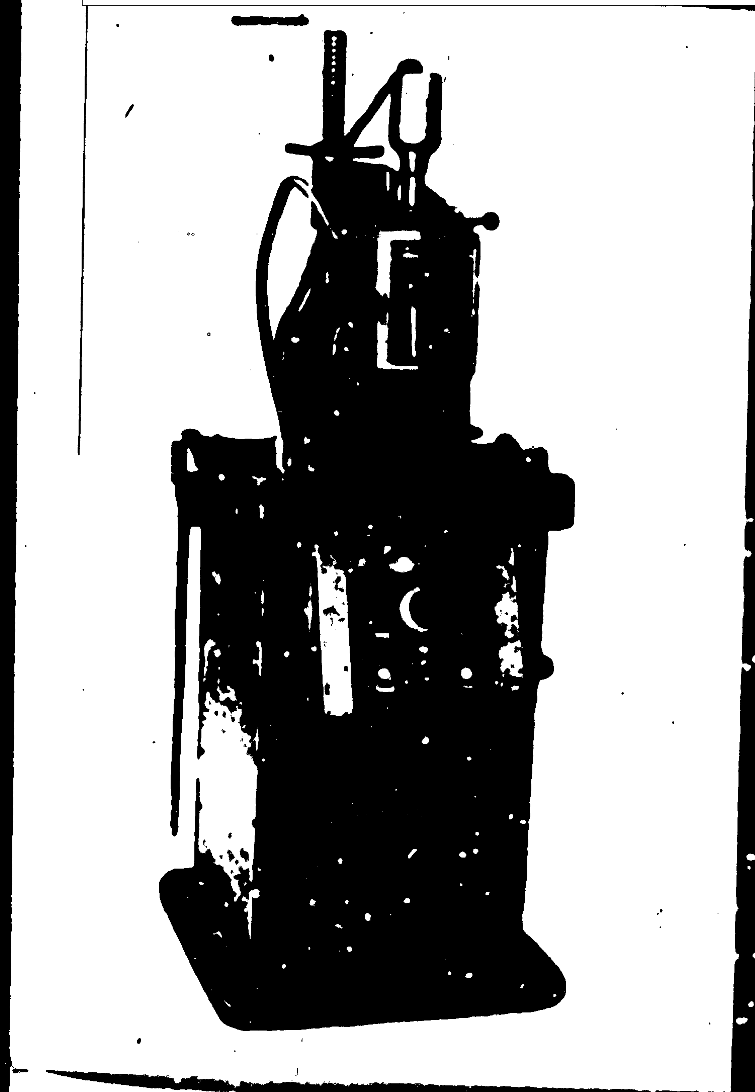

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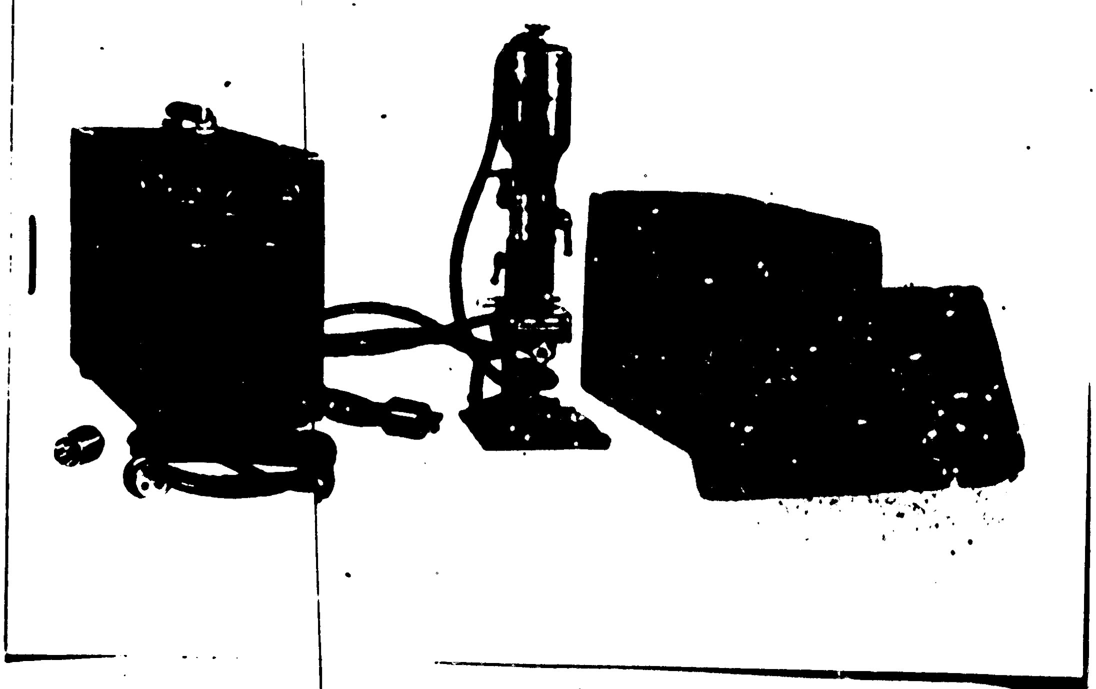

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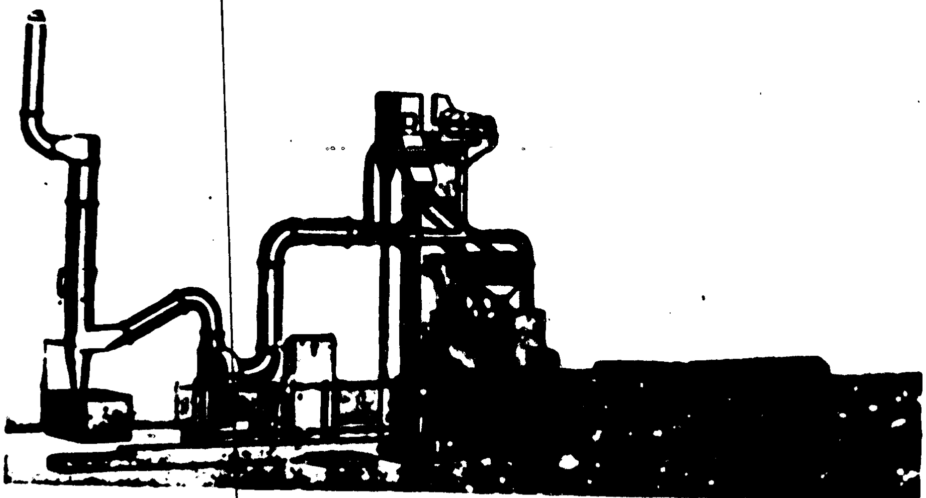

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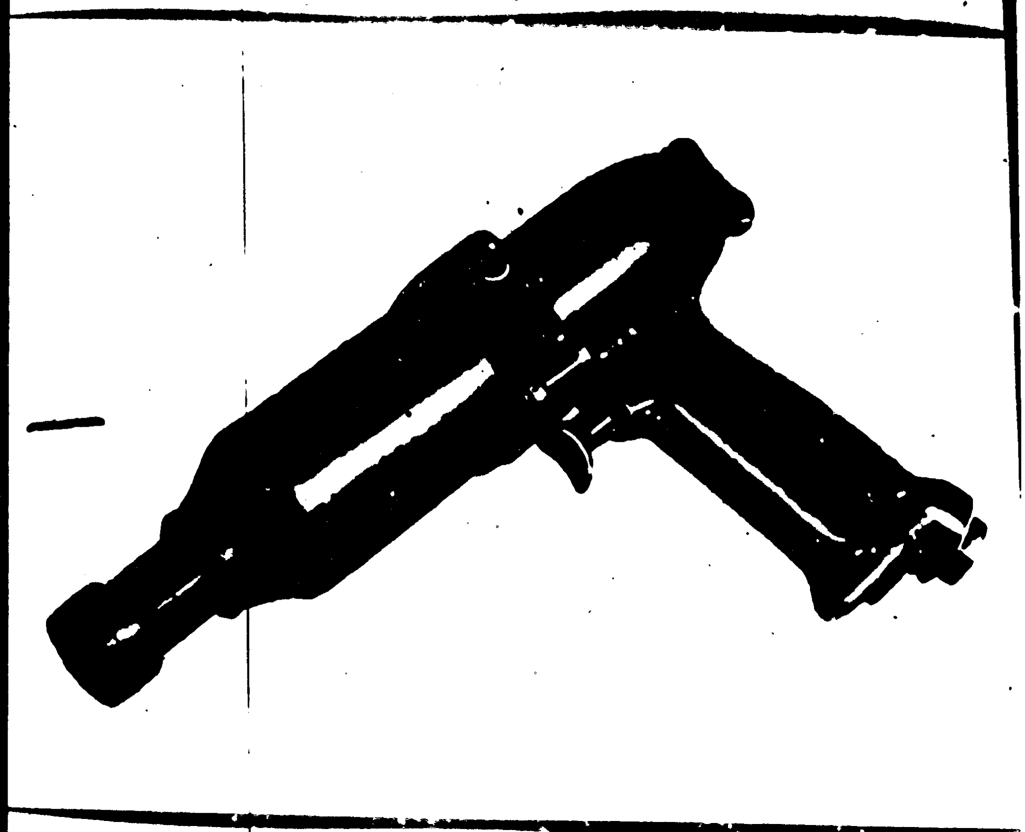

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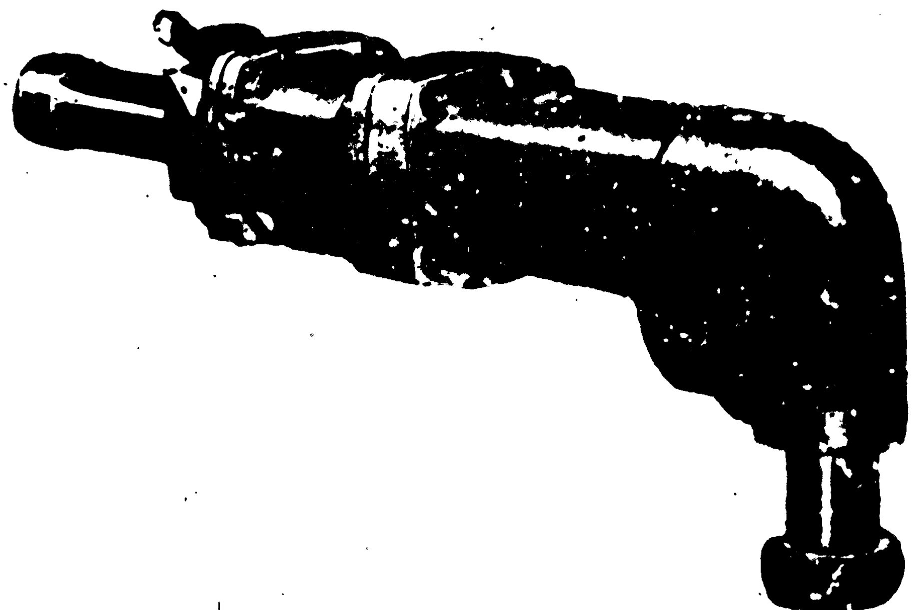

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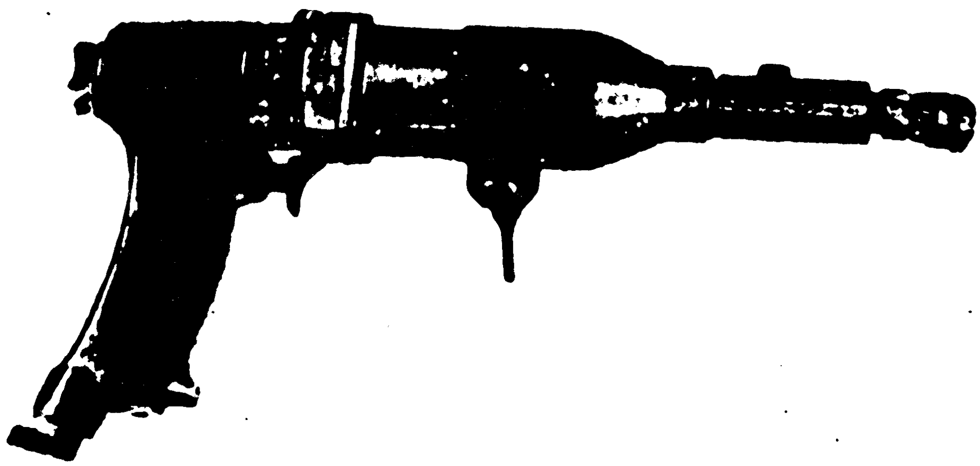

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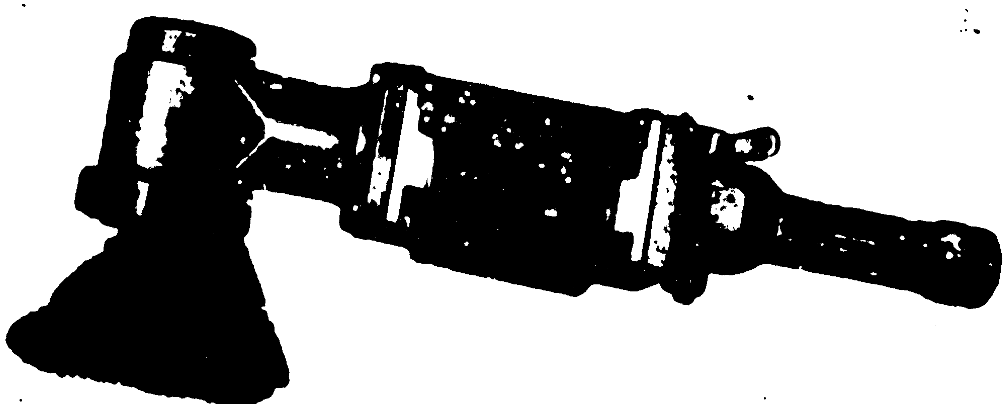

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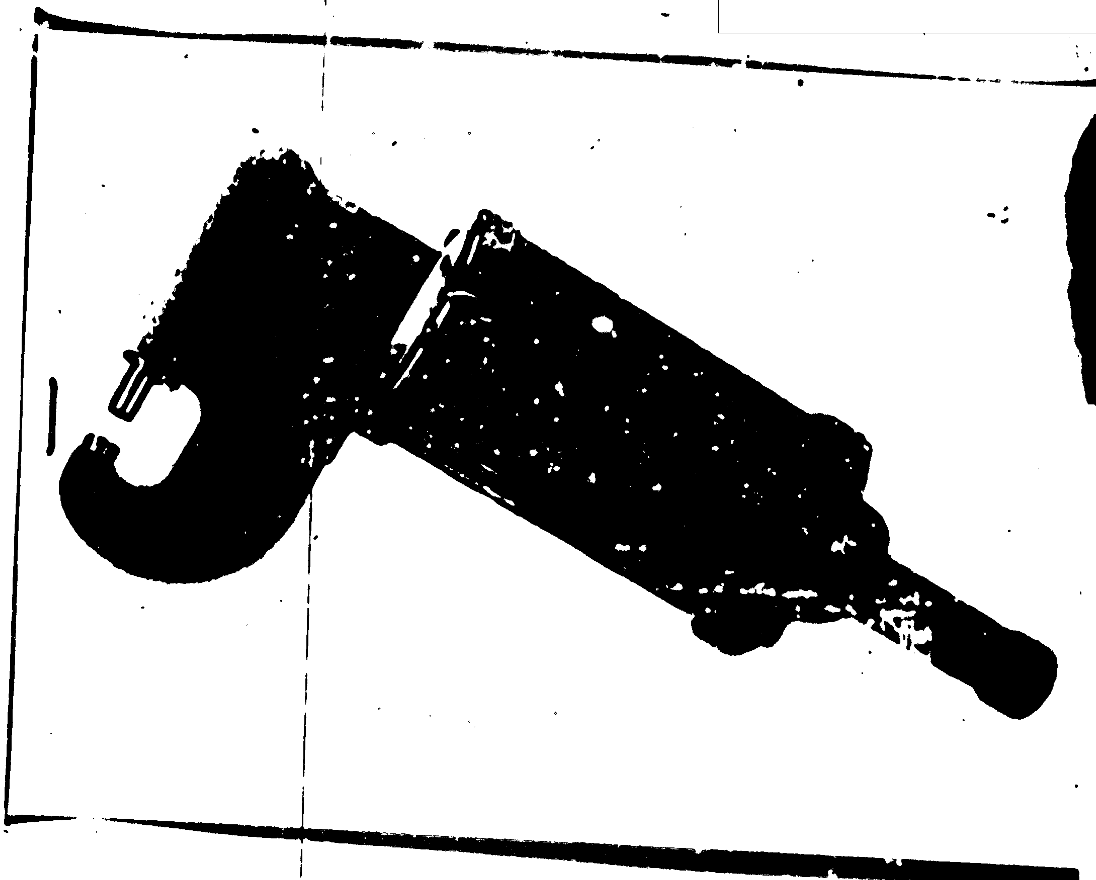

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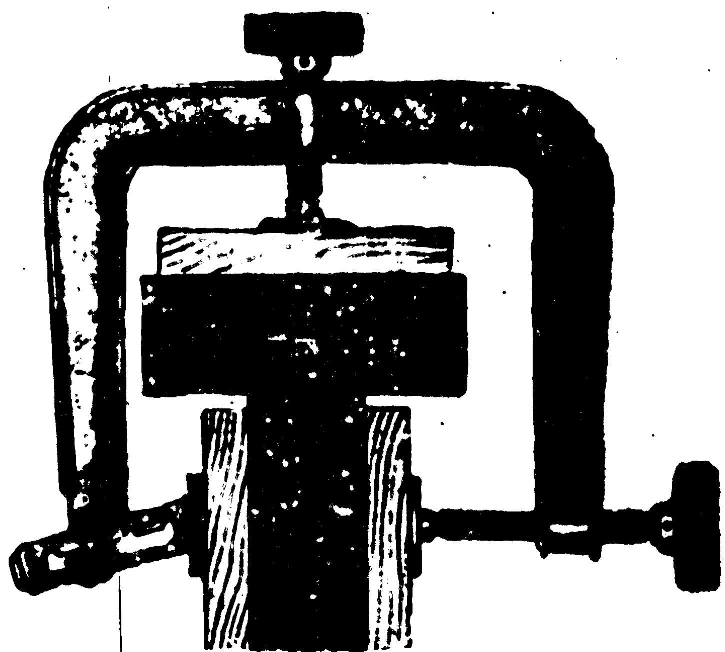

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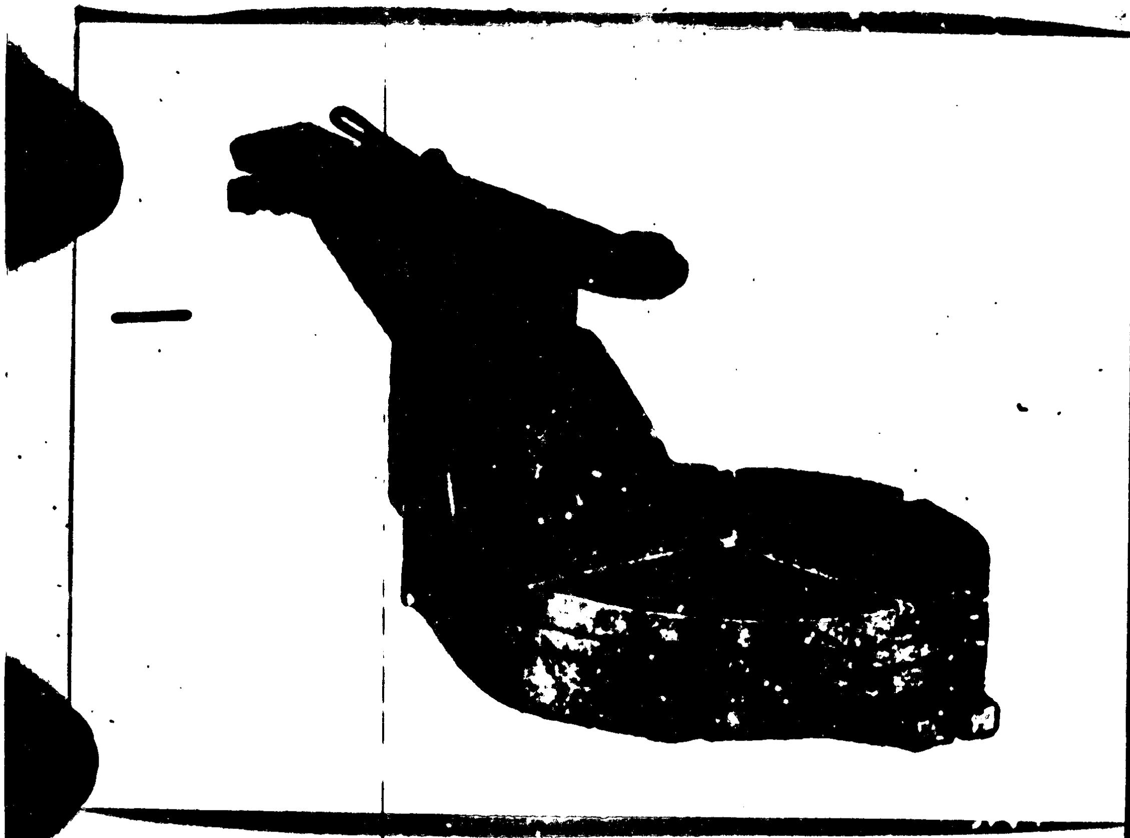

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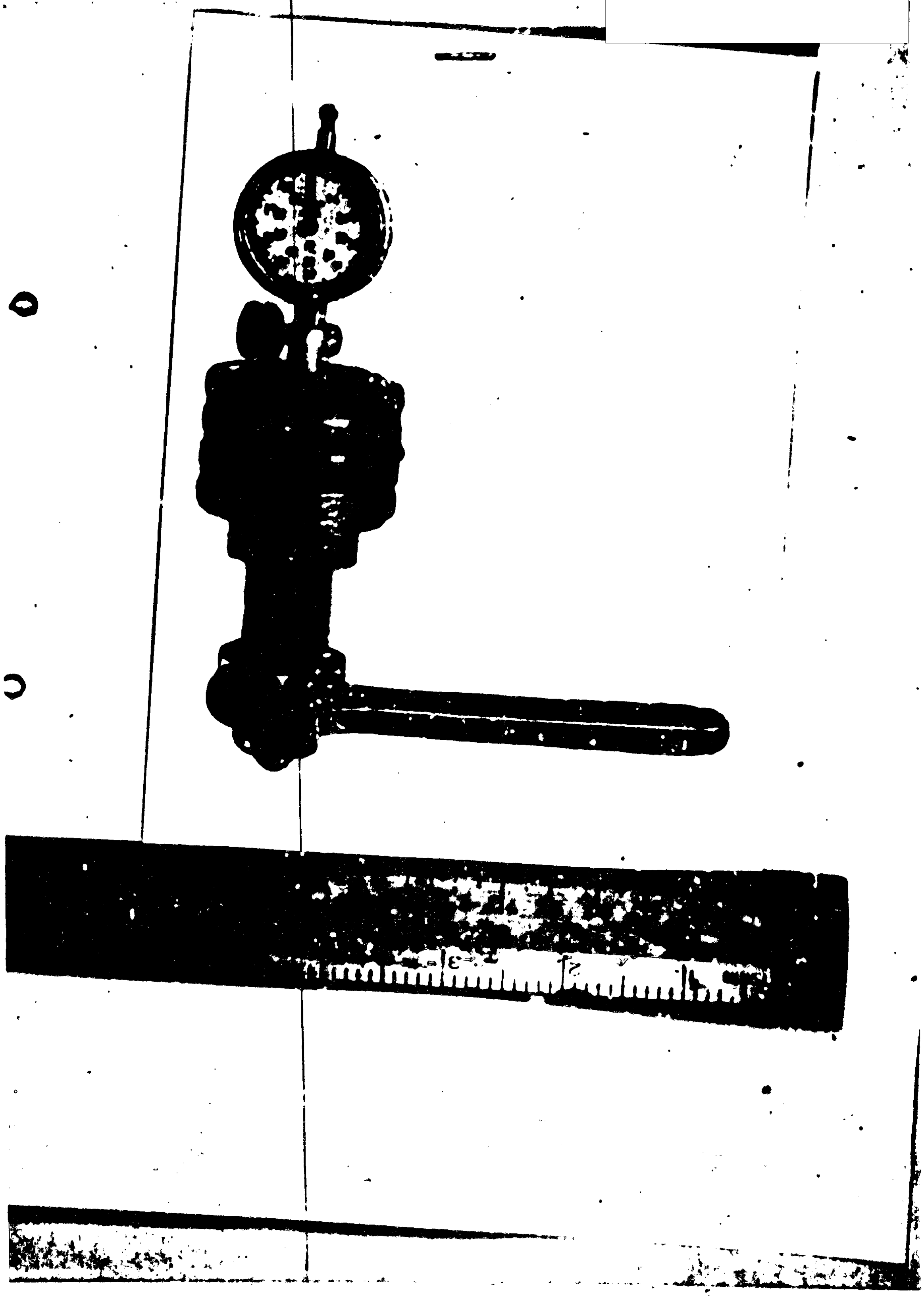

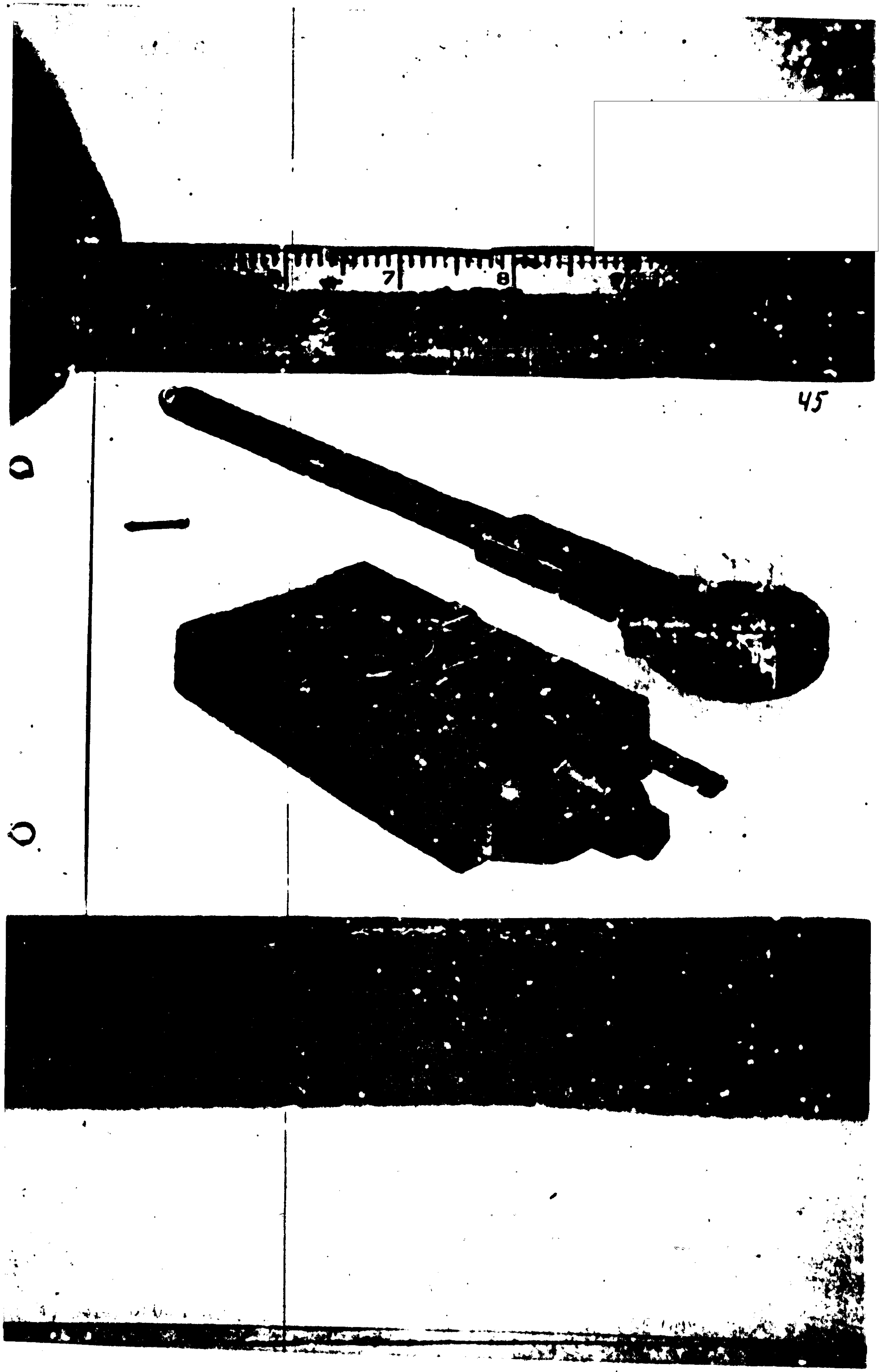
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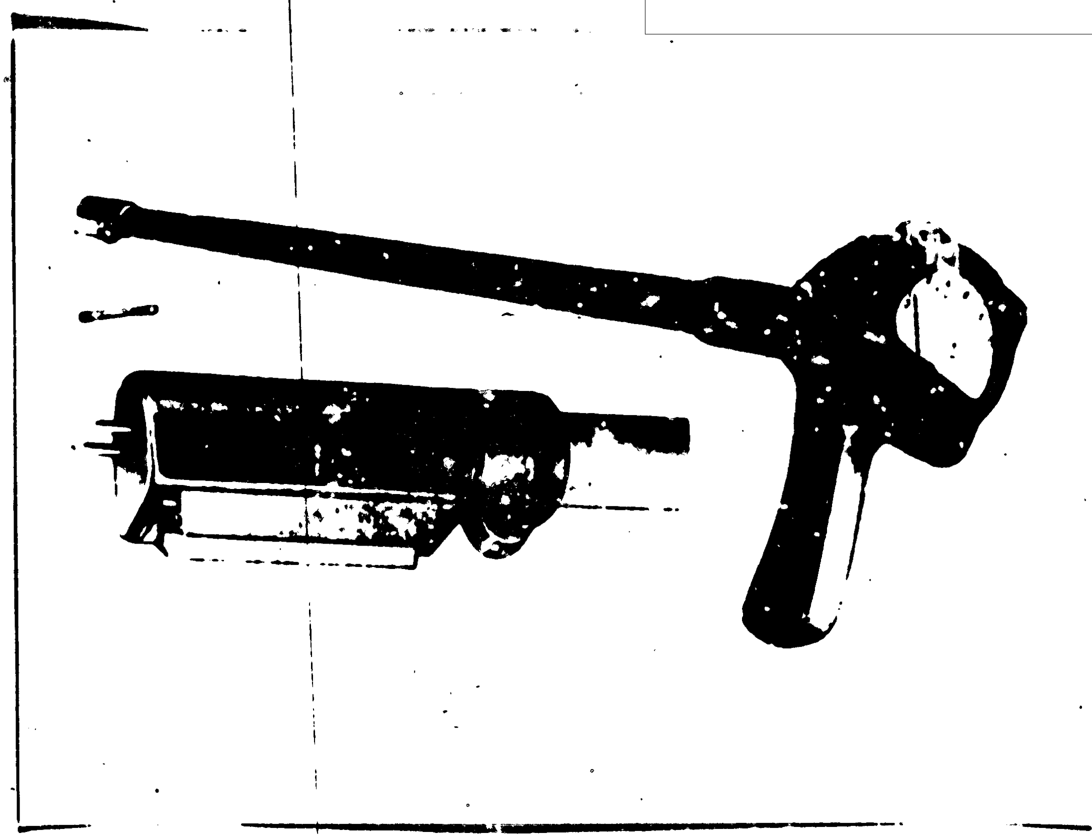

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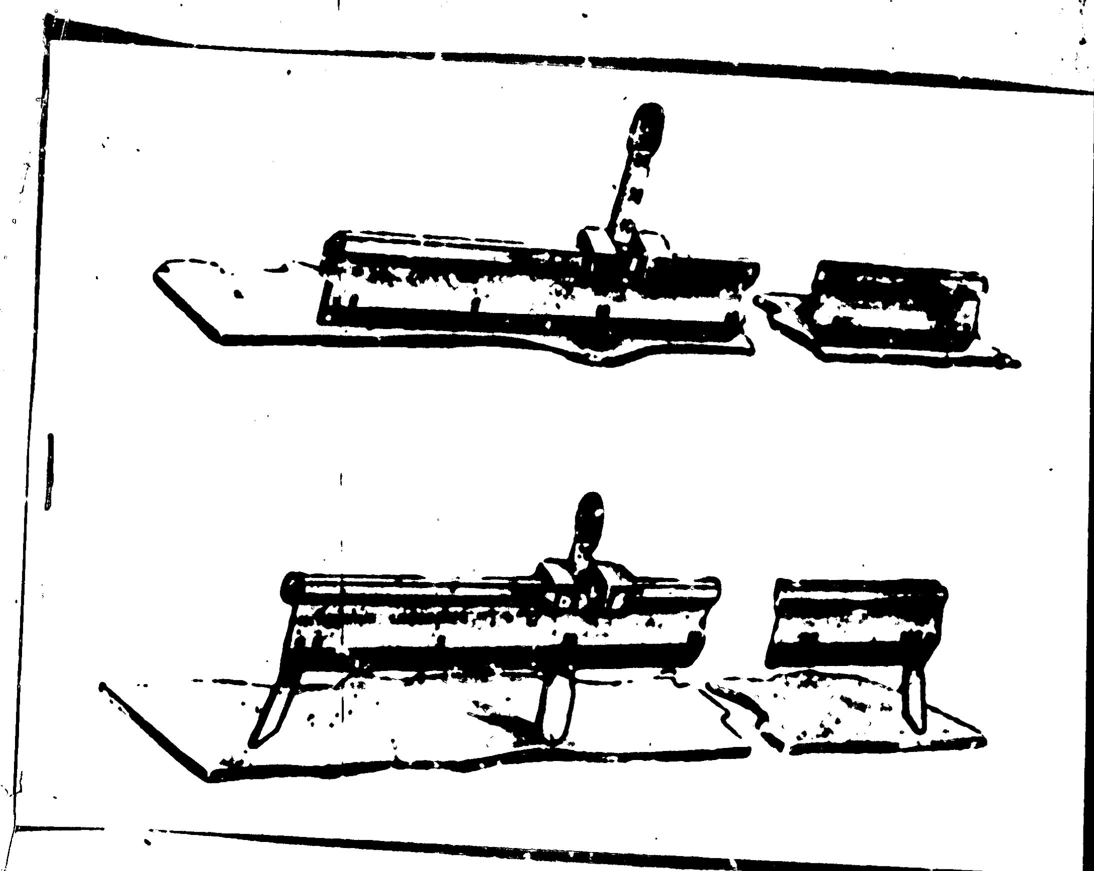

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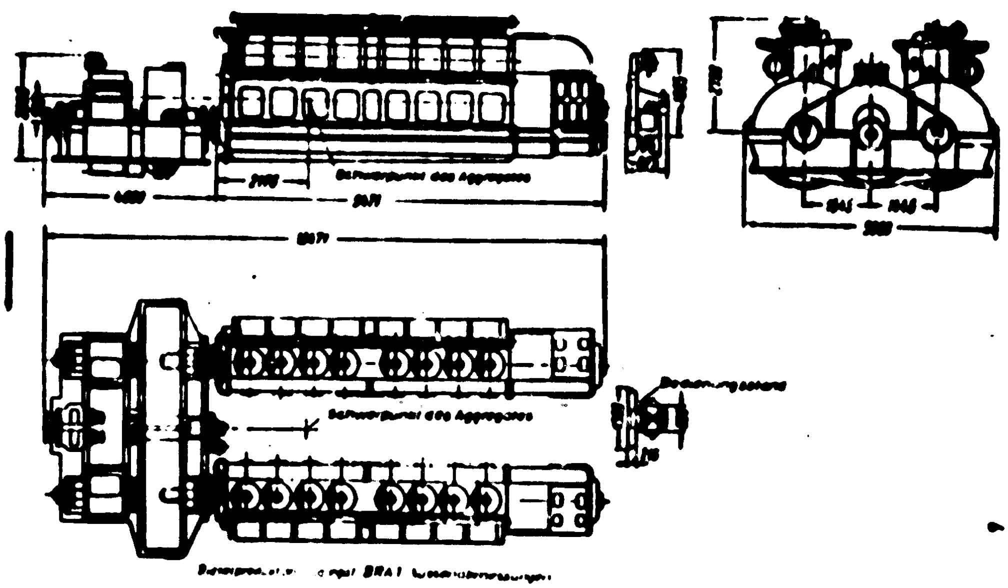

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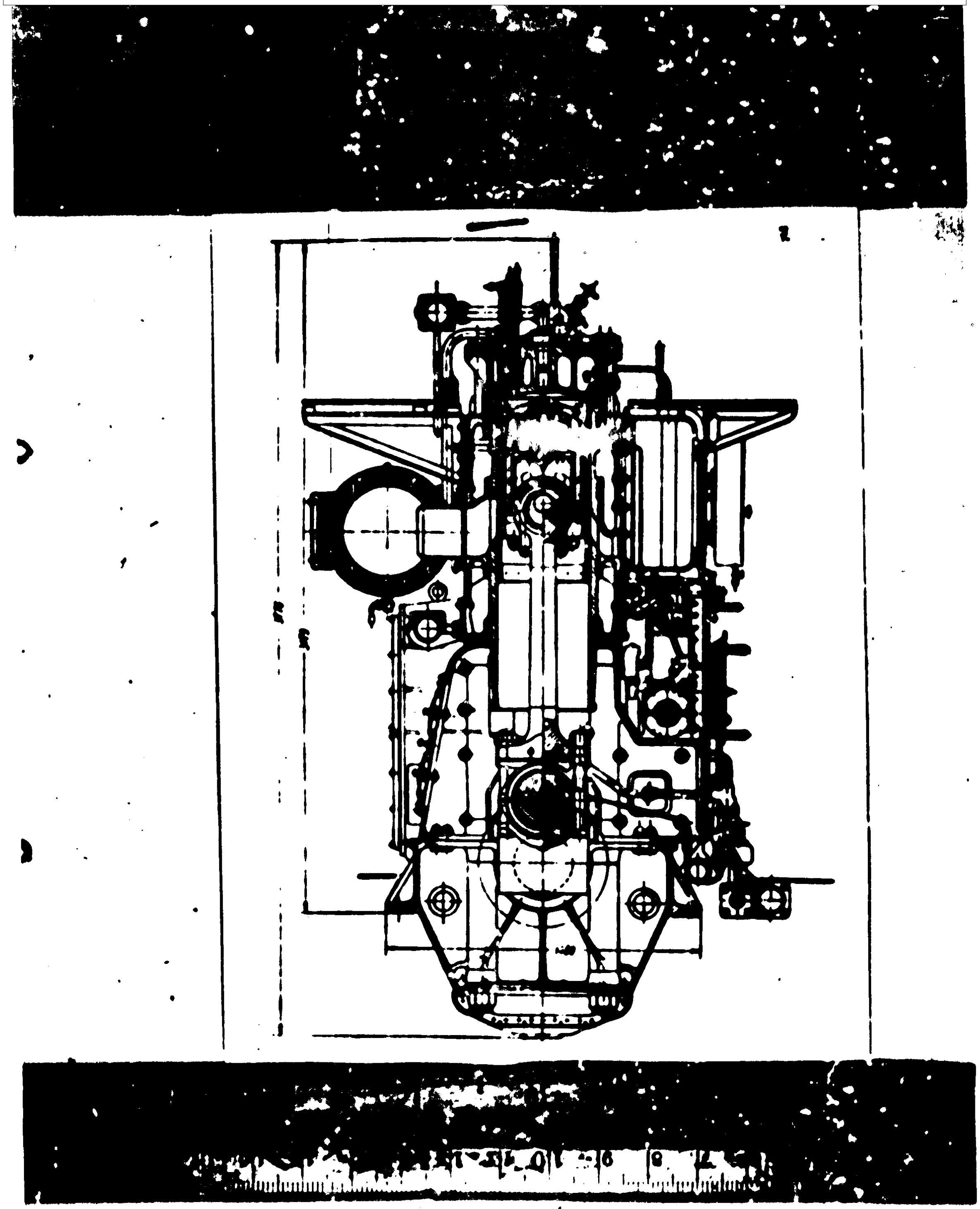

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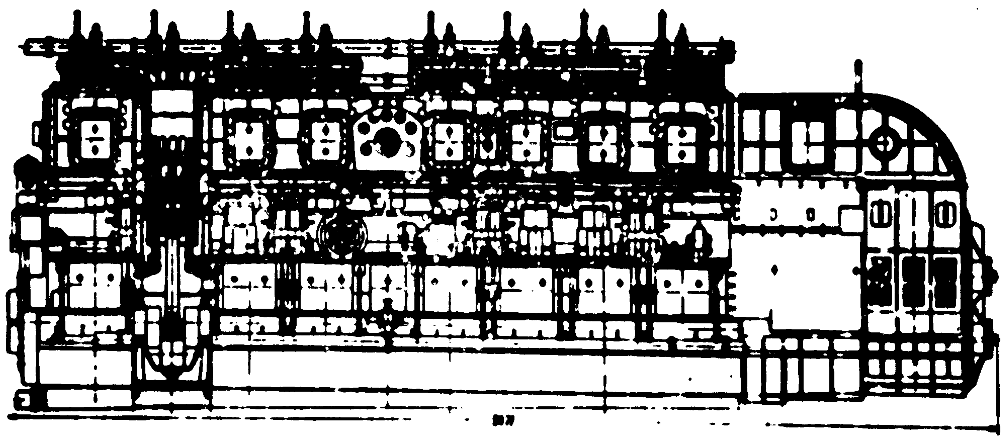

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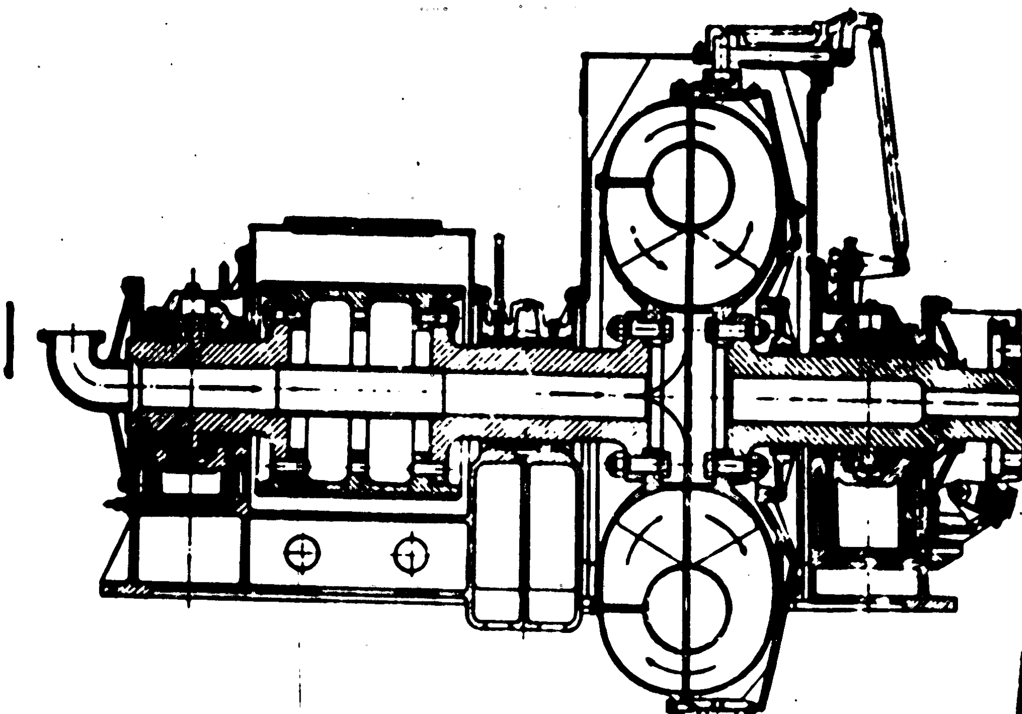

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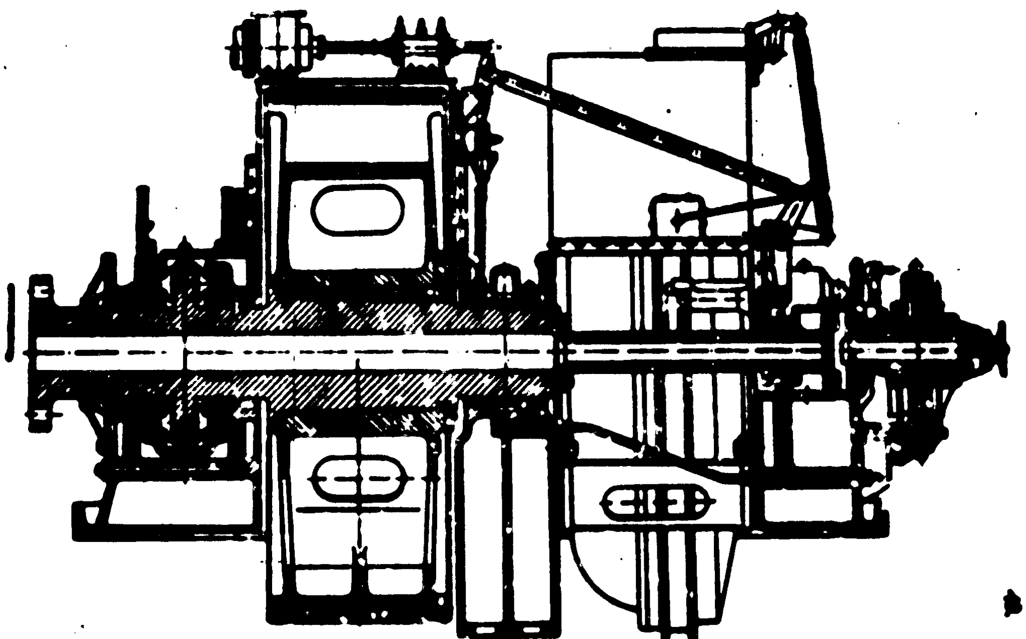

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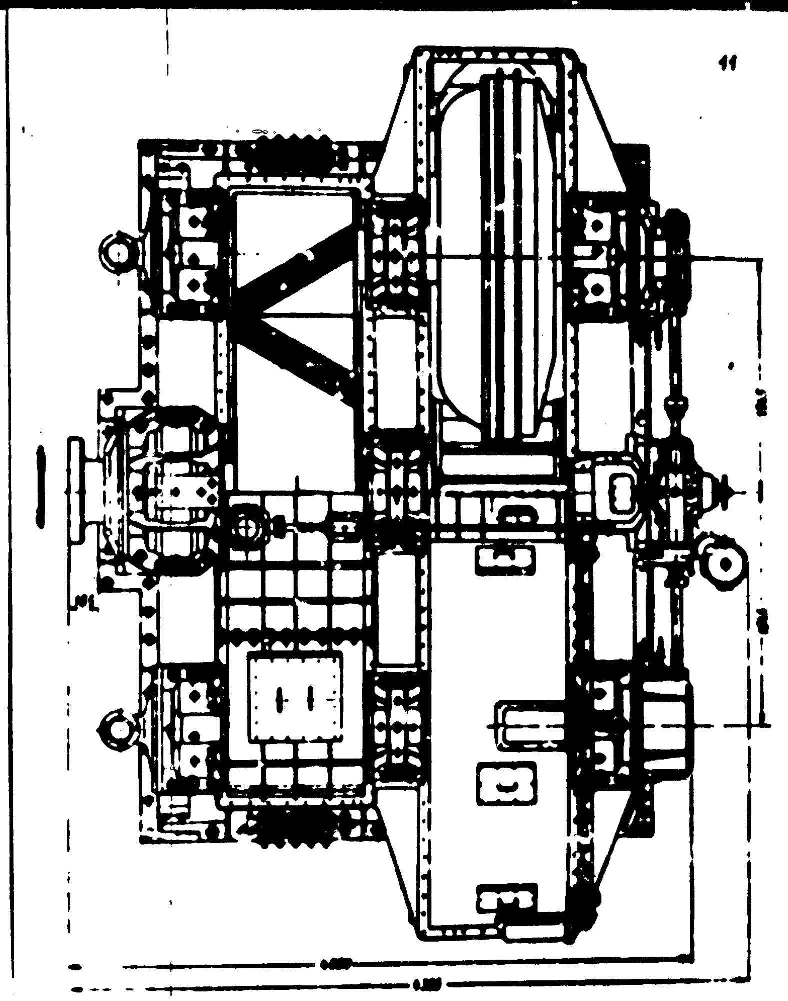

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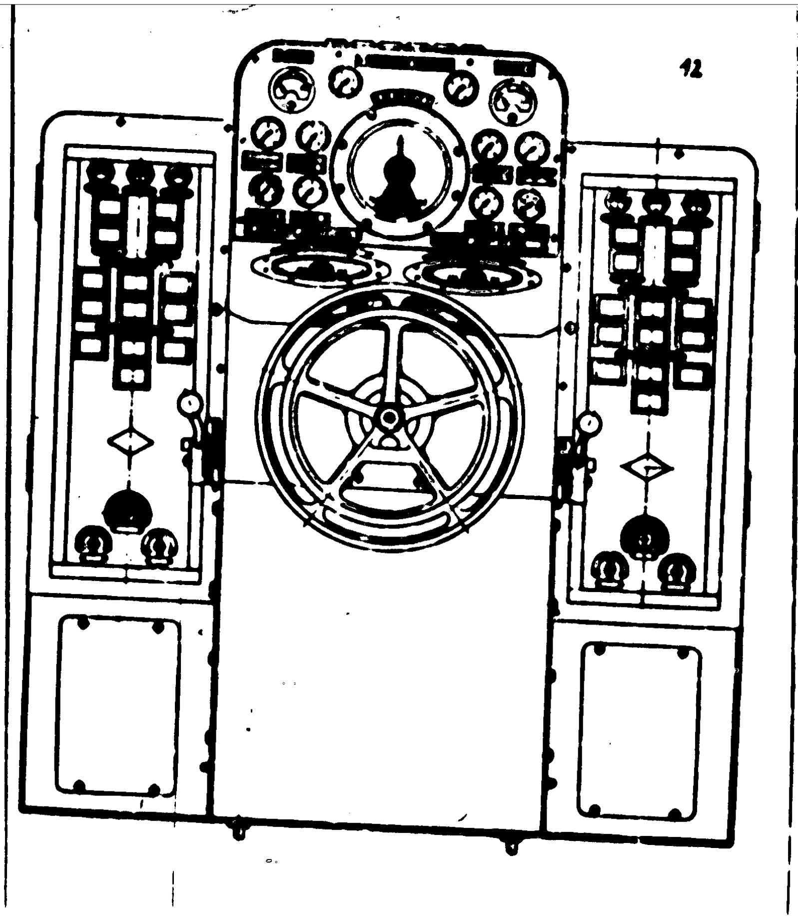

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